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A NEW SYSTEM

ON

FIRE AND PLANETARY LIFE;

SHEWING THAT

**THE SUN AND PLANETS
ARE INHABITED,**

AND THAT

**THEY ENJOY THE SAME TEMPERAMENT
AS OUR EARTH.**

ALSO,

AN ELUCIDATION

OF

The Phænomena of Electricity and Magnetism.

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And God said, Let there be light: and there was light. — GEN.

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[LONDON: 1856]

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PREFACE.

THE system which I now offer to the public I had formed twenty years ago, and shewed it then to some of my friends; but being fully aware of the great authorities I had to contend with, my resolution at that time gave way, expecting that a favourable circumstance would soon take place, in which I might have introduced it to the world under favourable auspices; but that hope, though every day expecting its completion, has still most unaccountably fled from me, so that I cannot help exclaiming, human projects are vain and transitory, when they rest upon weak, deceitful, frail man!

Upon perusing Dr. Herschel's system on the sun being inhabited, I thought it a favourable opportunity to publish my new and extensive system, as his authority had paved the way, and directed men's minds to the subject: and I hope that mine, though very different from his, will meet with due candour from that accurate observer of the heavenly bodies.

Fire has hitherto been a great bar to science, men not knowing any thing of its great qualities, power, and essence, in the works of the creation: how far I have passed that bar, I leave to the candid, the learned, and impartial world; hoping, whatever may be their
strictures,

strictures, they will be stimulated by the motive of fair investigation in searching for TRUTH—TRUTH, which is my sole object in these enquiries, to investigate nature for the benefit of man, sensible that the more enlarged his ideas of God are, the more he will venerate him. And I should hope, from the nobleness and the great consequence of the subject,—the researches into the greatest works of the Deity, that men would give it a full investigation, and that their observations and strictures would be extensive, formed upon the liberal basis of a desire for knowledge; and not cankered with envy, malice, or other abject passions, below a philosopher, and which I am afraid too often dictate the little mean criticisms of illiberal minds.

I flatter myself, that the scriptures and my system are not at enmity, but mutually elucidate each other; fully sensible that, both here and hereafter, religion is the ground upon which man must build his happiness. For men's knowledge and good I have ardently studied, and also I ardently pray; convinced the more we investigate the natural world, the more we will benefit the moral world.

This is but the first part of my system; the next will be upon the phenomena we observe upon our planet, which I have prepared for the press, and which I mean to give to the public immediately, if I meet with that candour I flatter myself my labours deserve.



UPON PLANETARY LIFE.

THERE is a great and wide chasm between man and other animals, God having given the former reason to explore his works ; and the exercise of that reason is what raises him above other animals. And, as the rational part is above the sensual, the more the former is attended to, the more it will be master of the latter : the mind in consequence will be enlarged and exalted, and carried nearer the Supreme Being, and further from the brutes, whose enjoyments rest upon the passions. But that mind which reflects and reasons upon the great works of the creation ; which, by regular and slow degrees, rises upon the hill of science, enjoys an enlarged and extensive prospect ; looks down upon the animals grazing at the bottom ; and is one of the strongest natural arguments for our immortality. Who can contemplate the great Newton upon the eminence, and the quadruped below, as beings made equally to perish by annihilation ! or, as Pope would have it, links of the same chain. Reason and the dignity of man revolt at the idea. Man, by exercising his attributes, takes a rapid flight, and leaves the brute far behind him. But the man who does not exercise his rational faculties, but grovels below, does not give proper dignity to his character ; and therefore the chasm appears in him not so great.

But, as intellectual enjoyments are superior to all others ; so God has laid open to man's industry the investigation of the great natural causes by which he conducts part of his works ; as it were, leading him from the gross things of this world, and preparing his

his mind for another. And what an heavenly reflection, to think that his knowledge in the next world will be extended nearer to God and his works! —the thought fills the mind with extasy, and lifts it above itself.

Whenever we are so happy as to arrive at the true knowledge of any of God's works, we are always struck with the power and simplicity by which they are conducted. Though man in his ignorance is always fabricating gigantic structures, yet the great chain, whenever it comes to our view, is formed of that beautiful symmetry,—one link hanging so easy upon the other,—the same cause branching out to such a wonderful extent, that the mind is equally astonished with its simplicity as its power, it being beyond all mortal comprehension. In short, language is unable to express it,—we can only say, *it is God's work.*

In observing the works of nature, we evidently see two causes operating; fire which comes from the sun, and the inert matter of our earth. At the poles, where little of the sun's influence is felt, nature is a torpid mass; and under the equator, where his greatest influence is given, there all is life.

The two great leading principles upon which I build my system are, that fire consists in motion, and that inert matter, which, by way of distinction, I shall call earth, consists in inaction.

The next two important principles I draw are, that the particles of fire have a great repulsive power to each other, being the first great and general law in nature; and from that repulsion consists its motion.

The next important law is, that the particles of inert matter, or earth, have an attraction, or gravitation, to each other.

Another great law is, that these two bodies, *viz.* fire and earth, have an attraction for each other.

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These two kinds of matter, fire and earth, upon our globe, have two striking qualities.—The first is *repulsion*, and the second *gravitation*. These two qualities give life to all nature; and, by their universal operation, are the two great causes of planetary life, and of life in general, as I shall afterwards prove. By the word *motion*, I would define life; for life consists in motion, and this motion consists in the particles of fire having this great property in repelling each other; and by this motion and repulsion, being regulated by another kind of matter, which has the power of gravitation, and both operating together, consist the well-regulated life of the universe, the great system of nature.

To be more explicit; if there were no other matter in the universe than fire, its particles would so repel each other as equally to fill the whole universe; and if there were no other matter than earth, which I call the gravitating matter, its particles would gravitate to each other so as to occupy a small space indeed. But, as these two kinds of matter have an attraction for each other, they unite their qualities, and, in consequence, the planets are of a large diameter; that is, the matter of these bodies occupies a large space. By uniting together, their qualities are blended, and also their space, or diameter, is blended. So that the matter of the universe is neither distributed equally through all space, which the repulsive quality of fire would do, nor contracted into one comparatively small condensed mass, which the gravitating power of earth would do; but they form many distinct masses, called suns, planets, comets, &c. forming bodies of different gravities, viz. solids, fluids, airs, &c. And also in their union they are not equally united, for a part of the fire is still free, passing from one mass, or sun, or planet, to another

mass, sun, or planet; and probably in the inmost part of this mass, sun, or planet, the earth is also free, forming a condensed mass or body.

Then it appears, that these two kinds of matter, fire and earth, sometimes do not unite together, *viz.* in the internal parts of these masses, or planets, where it is too deep for the fire to operate, and beyond its surface, where it is too far for the attractive earth to operate. So that in both these cases, the two kinds of matter, *viz.* fire and earth, are not united. And, as I have a right to suppose there is a regular succession of their operation; in the internal surface of those masses, the earth and its qualities principally operate. So as we advance to the surface, the earth will lose part of its influence, and the fire will begin also to operate; and, upon the surface, their operations will be equally blended, so that its matter will consist of both these bodies, being intimately united together, forming animals, vegetables, and minerals, and also water: for, by the different proportions and combinations of these two kinds of matter, they will form all these bodies; for all these bodies, I suppose, possess life according to this proportion of life or animation, *viz.* animal, vegetable, and mineral life, in the same proportion they possess a high, equal, and essential distribution, or proportion, of these two bodies: but, as we advance beyond the surface of these masses, the fire predominates, and forms bodies of unequal proportions, as atmospheres, vapours, &c. And, as we advance further, we find the fire free and disengaged, travelling from one mass to another, called the sun's rays. And I hope satisfactorily to prove, that these two kinds of matter which are the most removed from each other's influence are not perfectly free from each other's influence, but have a mutual action upon each

each other, *viz.* the inner parts of the masses and the free disengaged fire, called the sun's rays: for the former attracts the latter to fall upon its surface, and the latter repels the former to keep its proper distance, and to poise it in the firmament; and, as I shall clearly prove, to be the cause of the repulsion and gravitation which produce all the planetary evolutions. As our globe possesses such a great quantity of solid matter, it will, in consequence, gravitate to other bodies possessing large quantities of solid matter. And as also the globe possesses a large quantity of fire, both free and combined, it will also repel other bodies possessing a large quantity of free and combined fire. This is true and solid philosophy, and what we see clearly takes place upon our earth. No one can be a stranger to the process of gravitation in the bodies upon our earth, which has been fully shewn by the immortal Newton. And it is equally as clear to demonstrate the repulsive power of fire on bodies upon our earth: for if a body has ever so strong a cohesive or attractive power in its component parts, fire will repel those component parts, forcing them to recede from each other; so that, instead of attraction, repulsion shall take place, (seen in metals becoming fluid by fire) and if still a greater quantity of fire is given to the body, or metal, the repulsion will take place so as to repel its component particles to that great distance as to form an air, or vapour; and if still a greater quantity of fire is given to this body, it will still repel its component particles to a greater distance from each other; so that the smallest body might, by this means, fill the greatest space. For there is not a stronger fact in nature, than that bodies which contain a great quantity of this free fire will repel their component particles to any distance, and that no human force can

can resist this repulsion; that is, can make its particles coalesce while they retain this fire. Therefore, any bodies which contain a great quantity of free fire cannot possibly have their attractive, or gravitating, principle to act so as to coalesce; and, according to the proportion of free fire bodies possess, they will accordingly have their attractive, or gravitating, quality to act.

Now I shall more particularly endeavour to prove, that these two bodies, *viz.* fire and earth, from their two great qualities, repulsion and gravitation, are the great causes of PLANETARY LIFE;—and, as I shall hereafter prove, of life in general.

By the word *life*, in a philosophical sense, I would define motion: thus an animal's life, when it is extinct, gives birth to other motions, or life; its component parts are dissolved and broken down, and its parts give birth to other motions, or life, in the great system of nature, either animal, vegetable, or mineral life.

Then, agreeably to this definition, planetary life is to consist in the planets' motions round the sun; and I shall endeavour to investigate the cause of this wonderful evolution.

As we are confined to this planet, we cannot see what is going forward in others, nor in the sun, nor in the great space between the sun and planets. But, as the works of the great Being are all formed upon the simplest principles, let us enquire if none of those principles which he makes use of in his works upon our earth will do for planetary life. Fire, that great element which comes from the sun, we observe to have this great property of counteracting attraction, when applied in a quantity together.—Thus the metals which have the strongest gravitation, or attraction, in their component parts, if fire is applied

plied to them, it immediately counteracts that adhesion, so as that they melt, and their component parts have not the least adhesion to each other; and, as long as they retain that quantity of fire, no power can make them adhere again: nay, if a greater quantity of fire is added to their component parts, it will evaporate them, or form them into an aerial vapour; so that, while the vapour retains that great degree of heat, its component parts will be kept at an immense distance from each other, forming an atmosphere; and, as long as they retain that fire, will never coalesce.

It clearly appears, that bodies which possess a quantity of fire, their component parts must be greatly divided, and, as long as they retain that fire, their attraction is counteracted; but take that fire from them (as a metal for instance) and their parts immediately coalesce, becoming a firm metal again; that is, provided their particles, when they lose their fire, are at the time so near each other as to be within their power of attraction. Then, if we take a metal, I will suppose a drachm in bulk, and evaporate it, that is, keep its component parts suspended by fire, so that this metal, which occupied only the space of the eighth of an ounce, shall now occupy the immense space of one thousand gallons; in consequence, the particles shall be removed from each other one hundred and twenty-eight thousand times a greater distance than they were in their metallic state.

Just so in the heavens; the heavenly bodies, suns, planets, &c. are removed from each other; and, as I shall further prove, by the same cause, *viz.* fire. But let us take, for our example, either a metal or water. Mercury, for instance, as one of the planets is named after it. Mercury or water, two such heavy bodies, and two such bodies, which, without
heat,

heat, would become ice, and a hard firm metal bearing the hammer; evaporating these two bodies, which may be done when the weight of the atmosphere is taken from them, by a very small degree of heat, a less heat than subsists upon our earth, that is, the comparative heat which this earth possesses at the equator and poles, and the whole were mixed together. Now, as this small degree of heat keeps the heavy globules of the mercury or water suspended, why not the heavy globules of the planets suspended. If any of my readers are startled at the comparison between the small globules of the mercury and the planets, let them withhold their astonishment till I shall make the comparison just, by all the different phenomena that we observe in the planetary evolutions; so that I might account for them *a priori*, from knowing the great effect of fire: for the most certain guide in generalizing in philosophy, is to know whether the cause will account for all the phenomena.

The greatest quantity of fire that we can unite to a body, is by evaporation. Thus gold will receive an immense quantity of fire, heating it intensely; and if the application be continued, the gold will be evaporated, forming a vapour, which is known, upon the principle of latent heat, to contain an immense quantity of fire; and as long as it retains that heat, no human force can condense it again,*—a well-known fact, from the principle of fire-engines, where the vapour of water is made to have the strongest mechanical powers, resisting the greatest force.—Then we see clearly that the great power of fire upon our earth, is to enlarge the surface of bodies which

* And, it is worthy of remark, that bodies, when formed into vapour, have at the time both latent and fixed fire, and also free or actual fire, the same as the planets have.

contains

contains it ; and likewise, that no mechanical power can resist this increase of their surface, *i. e.* hinder their particles from receding from each other, while they contain this fire. That whatever attractive power the particles have for each other, the fire resists it. Therefore we have a right to adopt this principle, that, if it were not for the agency of fire, bodies, being actuated by their particles' attraction for each other, would contract into a very small volume ; so that gold, or any other metal, would become immensely heavy.

To elucidate this more clearly—If they possess very little fire, they will be removed a small distance from each other ; and, if they possess a great quantity of fire, they will be removed a great distance from each other. And also, according to the quantity of matter and the quantity of fire, bodies will attract and repel each other. If a small quantity of matter, and an equally small proportion of fire, they will have a small attraction and repulsion for each other ; and, if a great quantity of matter, and an equally great proportion of fire, they will have a greater attraction and repulsion for each, as the planets.

I have been speaking of fire in a loose, disengaged state ; but there are other states of fire in a chemical combination, with inert matter ; and thus gold contains a quantity of fire in this chemical combination. And there are different chemical combinations of fire. Thus water contains a quantity of fire in a very loose combination ; so, if it is exposed to a degree of cold of thirty-two degrees of Fahrenheit's thermometer, it will lose a part of its fire, and turn to ice. And again, there is another chemical combination more highly attracted, or combined, and in a far greater quantity, as in sulphur. The fire that sulphur possesses is immense, and its combination

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with the vitriolic acid is likewise so immensely strong, that no cold can give it freedom, or set it loose, but actual fire; so there are a great number of chemical combinations of fire in the intermediate states between that which forms ice into water, and the vitriolic acid into sulphur; and the variety of combinations and attractions forms the different bodies upon our earth; their different qualities and their different gravities.

When the works of the Supreme Being are investigated, we always are struck with their great simplicity, being conducted by a very simple cause, and that cause operating to so great an extent. Now, as Moses informs us, God created the world, and then afterwards light, which I call fire. First, I say, then he created inert matter, which, by way of distinction, I will call earth, and then repulsive matter, which I will call fire. These two bodies have very striking qualities.

Earth has this great quality, to attract, or run together, *i. e.* its particles attracting each other; hence gravitation.

Fire has this great quality, its particles repel or recede from each other; hence repulsion.

These two kinds of matter being created, the inert matter would form large masses, or planetary bodies; and fire, that body which gives life to these masses. These two bodies operating upon each other, as they have (as I shall afterwards shew) an attraction for each other, which attraction, along with gravitation and repulsion, will sufficiently account for all chemical attraction and repulsion. This attraction, or affinity, will greatly increase the bulk of the earth, by the fire's repelling power counteracting the earth's attractive power; so that part of the earth's particles shall be even rarefied into an air, or atmosphere, by the repulsive power of fire.

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The earth contains a great quantity of fire, which we are sensible of, from digging below the surface, where we always find one uniform temperature of heat; and from the earth being full of volcanoes,* constantly emitting immense quantities of fire.

Then, when we reflect upon the immense quantity of fire which the earth possesses in its actual or free state, as shewn by the thermometer; and likewise in its chemical or combined state, seen by all bodies being composed of it, as sulphur, metals, bitumens, animals, and vegetables; in short, all bodies, both of the animal, vegetable, and mineral kingdoms, we must be certain, that the planet, our earth, contains an immense quantity of fire. Totally to deprive a body of fire is not in our power, either of its fixed or free state; but we can go a good way in depriving a body of its free fire, producing that degree of cold, so as to freeze mercury: but still we have a right to suppose, that degree of cold is far from a total deprivation.

Then, contemplating upon this immense quantity of fire which our globe possesses, we must suppose, if the sun possesses an equal quantity, in proportion to its bulk, that this earth, or attractive particles of the sun and our globe, cannot make them gravitate to each other, but they must repel each other. But then, upon the other hand, that repulsive power must be counterbalanced by the attractive power. I shall, I hope, sufficiently prove, from attending to the planetary phænomena, that they are actuated by these two powers, from possessing these two great bodies, fire and earth.

As in my example of either water, or mercury, the power of their attractive particles being separa-

* These, as I shall afterwards shew, are necessary to planetary life.

ted by heat, so that the one is not ice, and the other a compact metal, bearing the hammer; which states we can easily produce by freezing them, or depriving them of a certain degree of fire. But, to make the analogy between them and the planets more just, the latter being an immense mass of matter, and the former very minute bodies; when their particles are evaporated, or held from attracting each other *in vacuo*; the same state as the planets are in: for even water, when raised into vapour, its particles are not minutely divided, but adhere together in very small masses, which is seen distinctly in vapour, and which, by having a certain degree of heat, still retain their form, so as to appear cloudy; that is, each little mass being only separated, or repelling each other; but, if a greater quantity of heat is applied to this cloud, or vapour, these little masses will be dissolved, and *their particles repel each other*, which is very often seen in the clouds, and which are a watry vapour, or the particles of water repelling each other; sometimes their little particles, or masses, will collect and form separate masses, or drops of rain; and sometimes, by having a greater quantity of fire from the sun, these little masses will be so dissolved as to become perfectly transparent, the cloud disappearing; so that they form all that variety of masses.

Then, upon the clouds being deprived of their fire, these little masses run together, from their attractive power, so as to form drops of rain; and, upon their receiving a greater quantity of fire, their little masses are broken down, or dissolved, so as to form smaller masses, becoming perfectly transparent. And upon a great and sudden deprivation of fire in the clouds, their particles will run together, so as to form large masses, or large drops of rain, and accounts for those large hailstones which sometimes fall: but nature produces

produces all those varieties of masses, water falling sometimes in large masses, or drops, and sometimes in minute masses, or drops, as mist. Then, upon the same great principle are the planetary masses gravitating to each other and repelling each other; and they will form globes of different masses, or bulks: and, as I have before observed, the heavenly bodies, *viz.* suns, stars, and planets, do not occupy a greater space, comparatively to their bulk, than the vapour of water does. But, as the quantity of fire in the universe is uniform, steady and constant, the planetary or heavenly masses are likewise uniform, steady, and constant.

But, as it clearly appears, (indeed there is not a more certain philosophical fact) that fire makes the particles of bodies recede from each other; and that no force can counteract this repulsive power; and that we see it as universal and as great a power as the great Newton has shewn gravitation to be:† how the particles of gold attract each other, but how fire counteracts that power, so that it becomes a fluid, its particles having not the least adhering power, but even form a vapour repelling its particles, or masses. Then, as our earth possesses a great quantity of fire, we must, by all true philosophical reasoning, allow its fire to have the same effect, repelling other masses of earth, or other planetary bodies. But, as the true mode of investigating nature, is to see whether all the phænomena will be accounted for upon the principles advanced, I hope to make it appear, that the phænomena and the principles go hand in hand with each other, elucidating each

† The great Newton found out that great principle, gravitation, from the action of bodies on each other upon our earth, *viz.* upon contemplating an apple in his garden falling to the earth.

other;

other; and that they will bear no other explanation; shewing a system worthy of the great Being that formed it.

The great and immortal Sir Isaac Newton fully elucidated one great part of this system, *viz.* gravitation; but, from not knowing the other, his system is forced and arbitrary.

We have as great a right, from our knowledge of the effects of fire upon our earth, to assert its repulsive power, as we have to assert the gravitating power of matter. The strongest chemical combination of fire with matter, that I am acquainted with, seems to be in sulphur, acids having a very strong attraction for fire; and I observe, that, when it is so strongly attracted, or combined, it loses greatly its repelling power, its repulsive power being principally when it is under no strong chemical combination. Thus the fire that is in one ounce of sulphur would, if free, expand the same quantity of acid to many thousand times the bulk which it holds in the state of sulphur, owing to its repulsive motion being suspended by its chemical attraction with the acid. But when its attraction, or combination, with matter is weaker, as in spirits, oils, &c. its repulsive power is a little more, and in consequence those bodies are lighter; therefore it has all the degrees, as I before observed, of its repulsive power, from its combination in the state of sulphur to its actual or free state. But, in its free state, its repulsive power is immense, and no human force can counteract it; that small quantities of matter contain it, as in vapour, or large quantities of matter, as in planets; that these masses, or quantities, will equally repel each other: and that not to allow of the repulsion of fire, would be equally as absurd as not to allow of the gravitation of matter, as they
both

both have an equal degree of facts that forces themselves upon our observation. And that all the phænomena that we observe in vapour are perfectly applicable to the planets; that in vapour, its matter is not uniformly separated, but is formed into little globular masses, as in dew; and, so in the planets the greatest quantity of their fire is upon their surface; the same, I suppose, in vapour, or these small masses of matter, the greatest quantity of their fire is upon their surface, more than in the mass itself.— So I would make this distinction, that, when the particles of matter are more equally distributed, as in transparent vapour, that the fire is more equally divided amongst the matter; but when this matter runs into little masses, or cloudy vapour, that then the greatest quantity of fire is upon the surface of these little masses; they becoming distinct masses of matter, with each of their atmospheres of fire; and that these masses repel each other is certain, so that no force can resist them.

Then, as we see clearly that those masses of matter always run into a globular state, seen distinctly in all fluids, whether in the state of water, vapour, &c. seen also clearly from the rain falling in drops. Therefore, when nature forms these large masses of matter, with such a quantity of fire as we know our earth possesses, particularly upon its surface, they also must be globular; *i. e.* the planets must be spherical.

If fire and matter have the same qualities in the starry firmament, as they have upon our earth, which I suppose no philosopher will deny, they must repel and attract each other; and, if we still argue from the analogy of vapour, the planets' repulsion and attraction will keep them about the same distance from each other, as we see them in the heavens: the comparison holds just in every respect. If small quantities
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of matter and fire attract and repel each other to a certain distance, (for argument's sake, I will say a thousand times their diameter;) from all true reasoning in philosophy, we have a right to suppose larger masses of matter and fire will do the same, if nature's laws are uniform.

We observe, that, whenever masses of matter are perfectly separated, that is, when thrown into a fluid state, that nature runs into little globular masses; and we observe these masses most distinctly in mercury, or quicksilver;* for it evidently appears, that whenever fire repels matter, so as to take away their particles' attraction for each other, making them fluid, that this matter forms itself into globular masses. And, to confirm this principle, we see clearly that the planets are separated from the sun, according to this rule; also the largest masses, or planets, are removed the greatest distance. But, according to Sir Isaac Newton's principle of gravitation, it ought not to be so. The greater the mass, the greater the attraction: and, in consequence, the greater masses ought to be nearest the sun: for, according to Sir Isaac's projectile force, which he has given us to counteract gravitation, it would not remove the largest planets the furthest from the sun. But we observe the stars, which we suppose suns, are removed a great distance from each other,—and which is agreeable to my system. There is no general rule without some exceptions. The planet Herschel is less in diameter than Jupiter and Saturn; but which may be accounted for in this way. As the Deity, we see,

* It is to be remarked, that mercury possesses a great quantity of phlogiston; also that earth does the same; and also that bodies which contain a quantity of phlogiston are evaporated, or suspended, with a small quantity of free fire, as spirits of wine, ether, mercury, &c.

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makes nothing useless, the great space between the planet Herschel and the neighbouring suns and planets is most probably filled up with other planets belonging to our sun, or system ; but those planets which are at the extremity of our system must be influenced by the suns and planets of other systems. Therefore, according to my general principles of repulsion and gravitation, these planets will get less and less in diameter, as they are placed further from our sun, and nearer to other suns and systems, by being under their repulsive and gravitating influence. And, according to this doctrine, Jupiter is the largest planet, and we see the planets regularly increasing from the sun till we come to Jupiter, and then regularly decreasing, probably in the same proportion, beyond Jupiter. As there are some exceptions to this general rule, the earth being larger than Mars, and Saturn than Herschel: yet, as I shall shew, that water, from evaporating the fire quicker than the land, and in consequence absorbing the fire, and by that means keeping that part of the earth colder ; seen clearly in the southern pole of our earth being so much colder than the north pole ; and in consequence the earth is nearer the sun when the south pole is turned towards it, than when the north pole is turned towards it ; therefore those planets which contain a great quantity of water will also be nearer the sun, according to their bulk, than the planets which contain a less proportion of water: besides Saturn has an enormous ring and seven satellites.

Sir Isaac Newton, whose name calls forth veneration, has described to us the full power of that great principle, gravitation; but, to counteract its influence, he formed an imaginary principle, calling it the projectile force ; and, as no natural law that he knew of could produce it, he was obliged to bring

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in the immediate hand of the Deity. But, upon investigating his principles upon this supposed power, we shall find them altogether inadequate to the effect : and I hope to give another cause, which we shall find fully adequate, and which we shall also find as universal a principle as gravitation upon this earth, I mean *repulsion*.

But let us consider Sir Isaac's projectile power.— If a body is put in motion, and neither the gravitation of the earth, nor the resistance of the atmosphere, acts upon it, it will continue that motion for ever ; therefore Sir Isaac supposed that this motion, which was given it by the hand of the Deity, would be continued for ever. But though this earth's motion round the sun has no atmosphere to obstruct it, yet it has gravitation, the gravitating to the sun. That the supposed projectile power and gravitation would make the earth, in its motion, obey the direction of neither ; but the diagonal of the two is certainly just. And if the earth, when it first received the projectile impulse, it also being under the impulse of gravitation at the same moment, would neither fly off in a right line from the sun, nor fall immediately into it, but would move between the two forces in a diagonal line, and would continue moving in that direction ; but, to continue it in that line, the two forces that impelled it should either cease immediately, or they should both be continued ; for, if the one continues and the other does not, it will obey the force that continues. Thus, if the projectile power should still continue, that is, should the hand of God be constantly operating upon it every minute for millions of years, and gravitation cease immediately after its first impulse, then it would, in a short time, fly off from the sun, it being under the direction of that force only, and the influence that gravitation imprest upon

upon it would gradually lose its power, the projectile power being continued every moment with the same influence as at first. So, *vice versa*, if gravitation continues to act constantly with the same unremitting force it did at first, and the other, the projectile power, instantly to cease after its first impulse, (that is, the force which acted upon the earth to cease acting, or leaving it to the first impulse of the projectile force) then gravitation would every minute gain upon the earth's projectile force, and in no long time it would fall into the sun. But to elucidate this plain and rational problem. If I take a stone and throw it from me, the force I give it would counter-act its gravitating to the earth; but the earth's gravity would be constantly and uniformly acting upon it, and it would soon be attracted by the earth, and fall upon it. But, supposing that I had wings, and to take the stone in my hand; or, which is the same thing, be constantly pushing it on with the same force I applied to it at first, it would go on uniformly as long as I continued the impulse. Or, another example. If I take a wheel, and push it from me with force, it will obey that motion for a while; but the earth's gravity will imperceptibly act upon it, and in a short time it will stop it; but, if I continue to give it the same projectile force, it will continue its motion. Or it may be illustrated further by a very easy experiment. If I take a ball, and discharge it, it will fly a long way; but if I fix a cord to the ball, and tie the cord to a strong stick, and then discharge it, by its being forced out of its direction, so as to fly in a circle round and round the stick, its motion will become slower and slower, and it will travel far less space; that is, if you measure with a cord the distance it would fly to in the first instance, and then measure with the same cord all its circles it makes

round the stick, the latter measure will be found, in length very much inferior to the former.

Therefore there cannot be any thing clearer, than that this projectile force of Sir Isaac Newton is quite inadequate, in every respect, to account for the planetary evolutions; and I dare say no philosopher can hesitate in agreeing with me, that, upon this representation, the cause is perfectly inadequate to the effect: and also that, if a natural cause can be brought, which is equal to the phænomena, it ought to be adopted as the true cause; for, where we are obliged, in accounting for phænomena, to bring in the immediate hand of God, operating out of the tract of natural causes, it implies ignorance of the cause.

We shall find, upon examination, that the projectile force of Sir Isaac Newton is quite inadequate to the planetary motions; and I hope we shall also find that my principle of repulsion perfectly accords with all their evolutions.

In the earth's progress round the sun, we see it perform the same steady motions it did a thousand years ago, they being neither abated nor accelerated. Its path being not a circle, but an ellipsis, owing to its motion being sometimes quicker and sometimes slower. Now, from whatever cause the projectile force is lessened, what should add to it again? We shall find, that Sir Isaac's theory of gravitation producing it is quite inadequate to the phænomena; and I dare say my reader, when he sees the full force of my arguments, will not require me to go into the minutiae of Sir Isaac's theory. But I shall make this observation, that Sir Isaac, not knowing the principles of fire, its great repulsive quality, therefore he formed a wonderful ingenious theory, from his strong imagination, upon this imaginary projectile force; and

and I hope his admirers will not too tenaciously cavil at any philosopher who should differ from him. Knowledge is progressive, and no human being can develop every thing himself, without he is supposed to be more than human: error and frailty are the lot of man; one adds so many steps to the ladder of knowledge; another mounted upon those steps adds others.—But let us proceed. I shall make my observations upon the moon's motions round our earth, as the moon being more immediately connected with our earth, and we can the easiest observe her path; therefore the facts that I will argue from must be more certain. While the earth moves round the sun at the rate of 58,000 miles an hour, the moon moves round the earth only at the rate of 2290 miles an hour; therefore the moon's motion round the earth must be greatly impeded, the earth moving so immensely quicker than the moon. Supposing that the moon received this projectile force from the Deity, and that the earth stood still, yet we should have all our former arguments to bring against this projectile power, as being inadequate to the phænomena; for I hope I have fully shewn its fallacy. But I shall now argue, upon the supposition that Sir Isaac's theory and his reasoning upon it are just, and see if it will account for the moon's motion round the earth.

This projectile power and this gravitating power then operating upon the moon will, I shall suppose, carry it round the earth, each balancing the other: but then, unfortunately for this theory, the earth does not stand still, but moves upwards of twenty times quicker than the moon. Therefore, when the moon is passing behind the earth in its path, *i. e.* in her first quarters, she will, instead of quietly obeying this projectile force and gravitation in forming her circle, be dragged by the gravitating power out of her course; that,

that, while the projectile and gravitating forces are propelling the moon 2290 miles in an hour, the earth's motion is dragging it out of this course 58,000 miles in an hour; and this must be, according to Sir Isaac's theory, by the gravitating power: so that the gravitating power not only acts an equal share in the moon's motion of 2290 miles an hour, but it acts alone in dragging it out of this course at the rate of 58,000 miles an hour. And it is a well-known fact, that, in the motion of bodies, any force, or power, that moves a body out of its course so much, so as the moon's course is altered, must entirely counter-act the first impulse, or force. For instance, if a cannon-ball were shot out of a cannon, and it were to fly at the rate of 2290 miles a minute, and after it had flown a minute, another force were to propel it at the rate of 58,000 miles a minute, a quite different direction from the first, almost at a direct angle, and should it then be stopped, would it not have principally lost the influence of the first propelling power?—But let us examine the moon in her last quarters, when she is moving before the earth, we will take her at that point where she is directly in the earth's path, immediately before it, or just before she comes to her last quarter. Then what hinders the earth from running foul of the moon? If the moon is operated upon by her projectile and gravitating forces, according to Sir Isaac they must run together; yes, even suppose that the earth's gravitating power was not acting at the time.

To enlarge any more upon it, would be to dispute the common sense of my reader. Then it clearly appears, that, as the earth advances at the rate of 58,000 miles an hour, with the moon directly before it in its path, there must be some force to drive the moon before it. It is so strong, that it drives the moon
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out of its course twenty times quicker than it travels round the earth. But still stranger reasoning at the moon's opposition; the earth and it are travelling the same path, and yet the moon's motion, when she alters that course, is found to have received no additional impulse. But still more wonderful, when the moon is in her conjunction, she then, instead of advancing in the heavens, is actually making a retrograde motion twenty times quicker than she is advancing in her circle round the earth; and when she alters that course, and is turning round in her first quarter, she is found to have lost none of her motion or impulse.

Then does it not clearly appear that, when she is travelling in the path behind the earth, she must still keep her situation, in respect to the earth, by the power of gravitation; and when she is travelling in the path before the earth, that she must still keep her situation, in respect to the earth, by the power of repulsion,—a power that is evidently driving the moon before the earth, just in the same manner as the spokes of a wheel hinder the rim from falling upon the axle-tree. These are strong, clear, and evident facts, that can only be accounted for by the principle of repulsion.

There is a wonderful phænomenon upon this globe, *viz.* the tides; and which Sir Isaac has endeavoured to account for upon the principle of gravitation; but let us enquire if this principle will account for the phænomenon. Sir Isaac's theory supposes, that the water of this earth, contiguous to the moon, is attracted by the gravity of the earth, so as to rise to that height, as to account for the tides.—But then, unfortunately for his theory, they equally rise on the opposite side of the earth; which is, according to his hypothesis, inexplicable. But he has given an explanation for this phænomenon, which,
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when investigated, I trust, will be found very extraordinary indeed, *viz.* that the waters upon the opposite side of the earth to the moon will, from being further removed from the moon's influence, in consequence accumulate there. But can any one suppose that gravitation can have this effect: will not the moon's influence, or gravity, also act upon the waters of the side of the earth opposite to it. To exemplify this, take a loadstone of a shape similar to the moon, and let it act upon a piece of iron, or any other body similar to the shape of the earth, and let there be placed upon it some loose iron filings, will any one suppose that, as the magnet acted upon the filings next it, it would not also extend its action to the filings on the opposite side, and also attract them; nay, to suppose that, while it attracts those contiguous to it, drawing them to it, those on the opposite side would, instead of also being drawn towards it, be repelled, or drawn from it, is very extraordinary indeed. I think no philosopher can assent to this; but, if any one is a sceptic, let him try the experiment, and he will find the filings, which are on both sides of the iron globe, are drawn to the magnet.

But, to make the experiment more decisive, let the filings be raised upon one side, and let the magnet be applied to the opposite side, and it will nevertheless attract them;—and not, according to Sir Isaac's doctrine, throw them into a larger heap.

I could bring a considerably greater number of reasons to refute this singular doctrine of Sir Isaac; but I suppose my reader must be satisfied. Now then let us consider if my doctrine will more rationally account for the phænomenon.

As water being a fluid body which is so easily put in motion, and as it covers so great an extent upon our planet, any action upon it, either attracting or repelling

pulling it, must have a great effect upon it, so as to depress or raise it upon the shores which bound it, as in a bucket of water; any motion upon the water rises or depresses it upon the sides of the vessel: and, as the moon and earth are held together by the principle of gravitation and repulsion, this fluid water must be sensible to their influence, easily depressed and easily raised by these two great powers. That, while the sun is heating one part of the earth and the moon, from the great principle repulsion of fire, (which I hope I have clearly and fully established) that part of the earth will have its waters repelled; while the other part of the earth, at the same moment, being far less heated, will have its waters attracted from Sir Isaac's principle of gravitation, and so produce a tide; then, in the course of twelve hours, those parts of the earth must have their heat and cold reversed, it heating that part which before was cooled, and that part being cooled which before was heated, and produce another tide: and so on, by the earth's daily turning round upon its axis, the tides are produced.

This will account, in the most satisfactory manner, for the tide being the highest at the moon's conjunction and opposition: for, while it is in its quarters, it is then, as I hope I have satisfactorily shewn, principally actuated by only one of the great principles; in the one case gravitation, and in the other repulsion: but, at the full and change of the moon, both these great principles are equally acting at the same time. The moon being over one hemisphere of the earth, repels its waters upon its shores, from the fire which they both possess; and upon the other hemisphere, from being less heated, its waters are attracted by the moon, and rush towards it, and in consequence flow upon the shores. Thus, supposing the sun and

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moon

moon passing over the Atlantic ocean, its waters will be repelled and drove upon its shores ; while, at the same time, the waters of the great Pacific ocean, being at the same moment bereft of the sun, will be attracted by the moon, and so flow towards it, and in consequence upon its shores ; and so *vice versa*.— And also, when the moon is passing over the Atlantic, and the sun at the same moment passing over the Pacific ocean, the waters of the Atlantic will be attracted by the moon, as they at the time possess little heat, it being then night, and so flow upon its shores. The sun's repulsion and gravitation are also to be taken into the account.

If, according to Sir Isaac's theory, the only principle that operated being gravitation ; as the moon was passing over the Pacific ocean, its waters would be attracted in the middle of the ocean, and so produce a very great accumulation only in the centre. But we see clearly that the change is produced on the shores, and not in the middle of the ocean. And moreover, according to my system, the tides will be the greatest towards the poles, as by repulsion the waters will be repelled from the equator, and rush to the poles. But, according to Sir Isaac's theory, it ought to be the reverse.

But my system will also account for the different planetary diurnal motions, upon which Sir Isaac's theory is perfectly silent. The two great principles are, that bodies, according to their quantity of matter, will be attracted ; and, according to their quantity of fire, they will be repelled. Now, while the sun is passing over water, the oceans for instance, its fire will be dissipated from the principle of evaporation ; and in consequence the heat will not be so great as when the sun is passing over the continents.— Therefore the Deity has formed our globe into
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two great continents, as it were, the oceans being placed between them; so, when the sun is passing over the Pacific ocean, that part of the earth will be attracted; but, when the sun arrives at our great continent, its surface will be so much heated, that the sun will in consequence repel it; and so, by this reciprocal repulsion and attraction, the earth will be turned round upon its axis. And, therefore, if the earth were all water, or all earth, it would probably have no rotation upon its axis; and, by its possessing two great continents, and two great bodies of water intervening between them, it therefore turns so quickly upon its axis. And upon these principles are accounted that singular phænomenon, why in our winter the earth is so much nearer the sun than in our summer, owing to there being so much more water south of the equator than there is north; and when the sun is in that part of its course north of the equator, *viz.* our summer, that it will be a greater distance from the earth, owing to the earth being so much more heated from its containing more land towards the northern than the southern pole; and also why the two great continents are not of equal quantities of land, and the two great oceans between those continents of equal quantities of water; for, if that had been the case, when the sun was upon any part of the globe, for instance, either over the land or water, there would be an equal repulsion and attraction of both the sides of the earth next the sun, and its repulsion and attraction being in consequence equally balanced, the earth might stand still; but, as it is, it cannot be.

Also, if the poles had an equal quantity of water and an equal quantity of earth, its annual motion might be stopped upon the same principle; but, as there is by far a greater quantity of earth upon the

north pole, when the sun is advancing to it, it will repel the earth the further from the sun, and in consequence the earth will be nearer the sun in our summer.

Also, according to my principles, there must be a regular annual motion of the earth; for, while either pole gets heated, or saturated with fire, it will then in consequence become repulsatory. Thus the sun, in the vernal solstice, having just come from the southern pole, warming or saturating it, will repel it; while the northern pole, from possessing at that time so little fire or heat, will be attracted; so that, till it gets its saturation of fire, it will attract; but, as soon as that is done, it then will repel, and the southern pole will attract, as it then will have lost the heat-it before had gotten, as fire is soon dissipated.

And, as I have shewn, that the earth is further from the sun when the sun is towards the north pole; so also, from this distance, the earth will have a greater circuit in the heavens round the sun, and in consequence the sun will be six days longer north of the equator, than in his circuit south of the equator, being our winter. Therefore it clearly appears, as long as the planets and sun possess such a quantity of matter, and such a quantity of fire, that those planetary motions must still exist.—But it is observed by astronomers, that the moon is nearer the earth than it used to be, from its performing its circuit round the earth in less time than formerly; which I account for, by there being less fire than formerly, and in consequence less repulsion: and why there is less fire, is, I suppose, from part of the moon's fire being attracted, or combined, with its matter, in that state which chemists call fixed fire; and, therefore, from its being fixed, or chemically combined, it will have less repulsion. It is more rational to account for the
phæno-

phænomenon this way, than that the moon's gross matter should have gotten an addition, so as to have increased its gravitation or attraction.

Sir Isaac's theory appears very extraordinary, he supposing the sun an immense body of fire, and that it equally extends its influence all around it. To a chemist, who understands the property of fire, this must appear very extraordinary. The sun, according to this doctrine, must be formed of a combustible substance, and all combustible substances are capable of being ignited; then what hinders the whole substance from being ignited at the same time; and, if so, must not the sun very soon have consumed itself, and have destroyed its counterpoising power to the planets. Besides, as fire is undoubtedly matter, and I think there is no doubt of its being a peculiar matter, what must have come of all that the sun has given out according to Sir Isaac's doctrine? We find our earth accumulates no heat; the heat of one year is similar to the former; and what comes of all the fire that is dissipated in the immense space around the sun, as the planets cover a small part indeed of that space?—These, when investigated, seem very gross ideas, indeed quite unphilosophical: besides it is burning some planets with a most intense fire, and starving others; beyond the power of the imagination to conceive, the extreme heat of some, and the extreme cold of others. This cannot be the work of the great Deity; it is no more like his works, than the sun in the firmament is like the sun upon a sign-post:—a God who makes nothing in vain; whose principles are so simple, and which principles extend through all his works, that every atom has its use and purposes, and tends to some great end.

The earth, according to my system, repels the sun equally as the sun repels it, according to its bulk,

bulk, and is a sun to it, according to its bulk ; that they are held together by the same power of gravitation and repulsion, producing the same evolutions, and possessing the same temperature of heat and cold, and in consequence the same animal and vegetable life. This is like the work of the Deity ; and, upon investigating it, we shall find, that the principles of my philosophy form this great chain in regular links, that one part imperceptibly follows the other.

We are certain that a great quantity of fire comes from the sun, and falls upon our earth ; that, in the night, or absence of the sun, that part of the fire which fell in the day is partly dissipated. This we know disappears from one great cause, *evaporation* ; and also from another, the fire saturates, or warms the earth, and part of it unites chemically, producing animal life, vegetation, &c. That evaporation is immense, appears from Haller's calculation of the quantity of water evaporated in the Mediterranean ; and from Dr. Black's calculation of the immense quantity of fire which is necessary to form water into vapour ; and from the Bishop of Landaff's calculation of the quantity of water which is evaporated by vegetation : this immense quantity of fire and water being carried up into the clouds, or the highest part of the atmosphere ; but there these bodies separate, the one falling as rain. Then the great question occurs, What comes of the other body, *viz.* fire ? It is well known that the higher parts of the atmosphere are extremely cold, there being a regular gradation of temperature in the atmosphere, the highest parts being the coldest. Then it is clear that this great quantity of fire does not remain there. According to the great principle of fire which I have demonstrated, *that fire repels fire, and also that the matter of our earth attracts fire.* The part of the earth which
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has the greatest attraction for fire, is *water*, which may be called the blood of the earth, producing a circulation of fire necessary to its own life, and to the animal, the vegetable, and mineral life upon its surface. The fire then which comes from the sun to our earth will be attracted by the bodies of our earth, and principally by the water; and, according to the repulsion of fire, this water, when saturated with fire, will be repelled from the heated surface of the earth into the higher parts of the atmosphere, and be there suspended; but they are there separated, the cold condensing the water, which falls upon the earth again as rain; and the fire being now at liberty, (before being kept suspended, owing to the gravity or the attraction of the water for the earth) it is therefore, in consequence, more powerfully repelled from the fire of the earth, and carried to a great distance from it. And now, from the repulsion of the heated earth, the fire being freed from the water, or matter of the earth, it receives a quick motion, and comes within the sphere of the attraction of the matter of the sun; and both these powers acting together give it that rapid motion which we observe the rays of the sun to have which fall upon our earth: for directly the same phænomena take place upon the surface of the sun as upon our earth; the fire which falls upon it is repelled or sent to it by our earth, and undergoes directly the same circulation upon its surface, producing animal, vegetable, and mineral life, and is then again sent back to our earth. So all the planets moving round the sun act as so many suns to it, returning again that fire which they received from it. It is thus the circulation is continued, till the Deity shall decree his *finite*. And this proves the truth of the Mosaic account of the creation, God created the earth, and afterwards light, or fire: for
Moses

Moses says—" *In the beginning God created the heaven and the earth. And the earth was without form, and void; and darkness was upon the face of the deep: and the Spirit of God moved upon the face of the waters. And God said, Let there be light: and there was light. And God saw the light, that it was good: and God divided the light from the darkness.*"

Now, according to my principles, matter would be the first formed, and after it fire; and this matter would be without form, and void of all life, till God created fire, which would give it life, motion, and form. And that, after God had formed fire, "*he saw it was good,*" it answering all the great and wonderful purposes of life in general. "*And God divided the light from the darkness;*" that is, gave to matter and fire these two great principles, or divisions, that one should be stationary, and fixed to the sun and planets, and that the other should circulate between those great bodies of matter;—for, upon those two great principles, or divisions, consist the life of the universe. As Moses had not the light of philosophy to guide him, his knowledge must have been from inspiration; that is, immediately from the Deity.†

† It has been considered as a great *diffiderata*, where the waters necessary to cover the earth in the deluge had come from. Now I think it most rationally accounted for by a heated comet in its passing immediately from the sun approaching our earth. It would in consequence violently repel our earth; which repulsion would operate so violently upon its waters, as to force them beyond its shores, and cover the land. Also, from the strata of shells found in the land, it might be, that the waters of the seas had been violently agitated, and repelled upon its shores, as those shell-fish live upon the shores of the sea; therefore they undoubtedly would be carried beyond them upon the land, and such an immense body of water would bury trees, animals, &c. in the ground; also carry them from one part of the earth to the other amidst the general wreck and devallation.

Sir

Sir Isaac Newton has sufficiently shewn the great power of matter, and its great principle, gravitation; therefore I shall not enlarge upon them, but enlarge more particularly upon fire and its great principle, *repulsion*.

I have shewn the repulsion of fire, when united with water; but I will now consider its repulsion when acting by itself, without any incumbrance; and we shall find this great principle more wonderful and essential in the universe than gravitation.—If I set free the fire which is contained in a candle, by burning or lighting the candle, as soon as it is set free, it shews the most surprising quickness of motion, and the most minute division of its parts; for the small quantity of fire contained in this candle shall, for hours together, while it is burning, form a stream of light that shall intimately fill the space of miles around it, and in an instant of time, so that different eyes, placed in different parts of this space, shall see it, that is, receive a part of this light upon the retina, and at the same moment, and all this from that great principle, repulsion; all the fire's parts being so minutely divided as to fill so large a space, and that in an instant of time, from each atom or particle of light repelling its neighbour.—WONDERFUL, O God!—From this great and simple cause, *viz.* repulsion, proceeds *all motion, all life*, balanced by the gravity of matter. Here then are the two great principles in nature, the author of all life, planetary, animal, vegetable, and mineral; and gives all those qualities to bodies, *viz.* expansion, elasticity, solidity, and fluidity; also chemical attraction and repulsion.—But more of this hereafter.

God having endowed inert matter and fire with these two opposite principles, *viz.* repulsion and gravitation, and from which sprang the life of the

universe. Good God, how simple, powerful, and wonderful are thy works!

This immense quantity of fire, which we know for certainty is carried from the earth to the clouds by the principle of evaporation, is not stationary there; for these clouds, or higher parts of the atmosphere, instead of being heated by it, are immensely cold. Now we must be certain, if this fire that is set loose there from the water did not circulate elsewhere, it would so accumulate as to heat the higher regions a million times beyond the heat of red-hot iron. Calculating the immense quantity of water evaporated under the equator, also the immense quantity of fire necessary to that evaporation; and we are certain that water has parted with the fire when it falls as rain or water again. Then, under this review of the subject, I speak within bounds, when I say, that the upper regions ought (instead of being cold) to be heated beyond the power of imagination. Nay more, we are certain that this fire is carried into the clouds, or upper regions; and we are equally certain that these regions are intensely cold; and also, we may be equally certain that those cold regions cannot, nor do not, heat the earth; therefore it must be self-evident, that the fire does leave the earth; particularly, as the higher we travel in the upper regions, the cold gets more intense.— If it were not from the fire leaving the earth again, what becomes of the immense quantity that falls upon the earth from the sun, even in England, after a summer's day? We see in the course of a night how it is gone;* and we are certain of the quantity which

* Even in the deserts of Arabia, in those burning sands, almost under a vertical sun, in the day-time, the heat is so intense as to produce upon the traveller unaccustomed to it, the disease called the *Coup de Soliel*; while the night will even be sometimes frosty.

the evaporation of the water must take. And, as we experience so often showers of rain from the water evaporated, they clearly account for the water evaporated; but, unless we should have also as frequently showers of fire, we must be certain that this fire necessary to the evaporation of the water does not return to the earth again, but must for a time leave this planet.—What an immense quantity of fire must the sun possess, to be constantly emitting it without its growing cooler; and the earth be constantly receiving it without its growing hotter. All these facts being duly weighed, it is self-evident, that Sir Isaac's theory is perfectly inadequate to the solution of the phænomena, while mine amply accounts for them; and also, that it is perfectly agreeable to all the known laws and phænomena of fire, and accords with the grandeur of God's works.

I believe all chemists are now agreed, that fire is a peculiar matter; for certainly its phænomena can only be accounted for upon this principle. But if, according to Sir Isaac Newton's idea, (who unfortunately was no chemist) it were the particles of matter in general put in motion, the sun must lose an immense quantity of its matter, and the earth and other planets must accumulate it; besides the immense quantity which, according to him, must be spent in endless space, as the planets fill up a small part of this great space. And the gross idea of the sun being a fire, and its emitting its gross matter as fire in this great space. If so, what becomes of it? Is it annihilated in this space?—Unphilosophical! for the planets must catch but a small part of this fire.

But, so far from the sun dispensing its fire equally all around it, upon the gross idea of its being a large globe of fire, we shall find that it falls only upon the planets, and even upon those planets not equally, but that one part of the same planets receives a great

quantity, while the other parts of it receive very little. It is well known that the sun dispenses its great vivifying heat principally upon the equator; and philosophers, agreeably to their mistaken philosophy, suppose that the equator's receiving so much more fire than the poles, is owing to the rays of the sun falling obliquely upon the poles. But, upon a philosophical investigation, we shall find that this is very inadequate to the cause, as the rays of the sun, according to them, are equally dispersed from all its surface; therefore the only difference of their intensity and power must be from being nearer or further from this globe of fire. Supposing the earth annihilated, and the objects placed at the same distance, or in the identical same space as the equator and the poles occupied, so as equally to partake of the sun's influence, or fire; the only difference would be, that those bodies placed where the equator was would be nearer than those bodies placed where the earth's poles were; but that the rays of the sun would fall as perpendicularly upon the one as the other.—The obliquity therefore is not from the rays of the sun according to their philosophy, but only with respect to the earth, their falling obliquely upon it at the poles. But how can that effect the intensity of the rays of the sun?

To make this clearer, suppose a large globe of earth, or wood, one hundred feet in diameter, being placed one hundred feet above the earth at the equator, and another of the same diameter placed just in the same manner at one of the poles, the same distance from the earth; and then suppose the earth taken away from those bodies, or annihilated, would not then the fire from this burning sun fall equally upon both these bodies, as perpendicularly upon one as the other? The only difference, as I before observed, the body placed at the equator would be nearer
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the sun than that placed at the pole. But then this difference of the distance is nothing of consequence, as it is well known, from Sir Isaac Newton's immortal calculation, that the earth in our summer is a great deal further from the sun than it is in our winter, making a considerably greater distance than the small difference of space which the poles are to the equator from the sun.

Therefore we must look to some other cause to account for this wonderful phenomenon, *viz.* the heat being so much more intense at the equator than it is at the poles: and I hope we shall find an easy and rational explanation from my philosophy. Fire and the matter of our earth have a great attraction for each other; therefore the earth will attract the fire issuing from the sun, within its circle of attraction, the other planets catching the rest. But then, according to this attraction, this fire will not be universally distributed upon the earth; but that part of the earth which is nearest the sun, and in consequence will the sooner attract the fire when it approaches very near. The poles and the equator being at a very trifling distance, in respect to each other, from the sun, and must have little influence when the fire first issues from the sun; but when the fire approaches very near the earth, then this distance of the poles and the equator to the fire becomes very considerable indeed, and must sooner act accordingly upon the fire, and more strongly attract it. Besides Sir Isaac has wonderfully calculated, (and which calculation has been verified by the French philosophers who were sent to ascertain the fact) that there is a greater body of earth about the diameter of the equator than about the diameter of the poles, and therefore must in consequence attract the fire more powerfully.— This is demonstrable; for, when the earth presents
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that part of its surface which is north of the equator to be nearest the sun, the greater part of the sun's fire in consequence is attracted by it; and when it turns that part of its surface that is south of the equator to the sun, that part receives the sun's influence most powerfully.

That the rays, or fire from the sun, are powerfully attracted by matter, we have ten thousand demonstrations of upon our earth. When a ray of light passes through any transparent medium, it is powerfully attracted by that medium, and even bent out of its rectilinear course, by the matter of that medium. Thus passing through glass, water, or other bodies, which contain a quantity of matter, it is, according to the quantity of matter the body contains, attracted by that matter, and bent out of its course. If it is a rare medium, it is very little acted upon; but, if very dense, or solid, it is much attracted by it. But it is so well-known a law in optics, that I need not enlarge upon it, but conclude with this general observation, That, according to this law of optics, the rays of the sun must be considerably attracted from their rectilinear course when they come from the sun, by those rays first being under the influence of that part of the earth which is nearest those rays, or whose influence they first meet with in their falling upon our earth, according to one of my general principles, that matter attracts fire. And, upon other principles of my theory, another most striking phenomenon is accounted for, *viz.* the earth's annual motion: for, according to my two great general principles, the earth, or matter, attracts fire, and that fire repels fire; so, upon the north part of the earth being nearest the sun, it will attract the fire of the sun; but, upon becoming heated, or getting its full saturation, it then, instead of being attracted by the
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sun, will, from its fire, be repelled. So the same of the south part. And, as one pole gets cooled, gravitation preponderates; and, as it gets heated, repulsion takes place: so that, by this attraction and repulsion, we have our regular summers and winters. Upon these principles, we also have our day and night,—as one part of the earth is heated, it is repelled, and the cold part is attracted. But, in these motions of the earth, there are other causes which are to be taken into the account. A great part of the globe is covered with water, and from the water's quick evaporation, it escapes with the fire, (being, as I observed before, the blood which circulates the fire) and carries it back to the sun, at least within the reach of the sun's influence. Therefore the ocean is never so heated as the land, and for this reason: the south pole, as it contains a far greater proportion of water than the north, is consequently comparatively colder, which is the cause of so much ice being there, and which hinders navigation.—And, from this great disproportion, the north pole containing so much more land than the south pole, the Deity has provided against this annual motion being stopped; for, if their proportions of land and water had been equal, the two poles might have been in danger of balancing their repelling and gravitating powers, and the annual motion in consequence lost. And also, when the earth at its first origin must have produced this annual motion, as the north pole contains more earth, and in consequence more matter, it must therefore have been the first attracted, and leaned nearer the sun: for I have no occasion to observe, that land is specifically heavier than water; besides the land's surface, along with vegetation, is considerably above, or higher than, the surface of the water, and in consequence its diameter must be greater.

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These principles will also easily and rationally account for the diurnal motion. As one part of the surface gets heated, it will be repelled, and the colder attracted, as the earth being suspended by the principle of gravitation, or attraction, to the sun, also the principle of repulsion from the sun; therefore, as a part gets heated, it will repel; and, according to the degree it loses its fire, gravitation, or attraction, will take place; so one part will be repelled, while another will be attracted, as it loses its fire, or heat, in the night. All this is clear and demonstrable. But, as I have shewn in the annual motion, there is another cause to be taken into the account, as the two great continents, or tracts of land, of the old and new world run from pole to pole, oceans intervening; therefore the greater repulsion of the land, by being so much more capable of being heated, will, in consequence, repel more than the water; therefore this also will assist the diurnal motion; for, as the earth, or land, gets heated, it will be repelled; and, as the water, or ocean, gets cooler, it will attract, as I have before shewn, the former being more susceptible of being heated than the latter. And also, if the two great continents, and the two great seas between these continents, had been equal in magnitude, the earth, or globe, might have been in danger of losing its diurnal motion. Upon the same principle, as I have just shewn, it might have lost its annual one, from its gravitating and repelling powers balancing each other; but, from a greater quantity of land being placed upon one part of the globe than the other, that never can take place. How great and simple are thy works, O God! The earth has a very quick diurnal motion, and also an annual one; while the moon only revolves round upon its axis once in a month. Upon examining its surface upon my principles,

ciples, that slowness of motion will be accounted for. The moon's land and water being intimately mixed together, not as our earth, forming large oceans and continents; and, upon accurate observation, we observe the most land upon that part, or side of the moon, which is constantly repelled from the earth in its monthly revolution, and, in consequence, most water upon that side which is regularly attracted in forming its monthly movement: therefore, according to my principles, the moon's motion, it only revolving round its axis in a month, is fully accounted for. And, by knowing the land and water of each planet, and their relative situations of the land and water to each other, we would be able, *a priori*, to know what would be their motions.

According to my theory, this great and powerful agent, *fire*, must be passing and repassing at the same moment to and from the sun. And, according to our idea of gross matter, water, or any other fluid, passing and repassing in the same channel, is absurd; but this great active body, *fire*, is actuated by different laws and principles than gross matter; one body of fire does not impede the motion of other bodies of fire. But, as this is an age for experiments, I shall refer the reader to the Count de Randall's experiments in the *Philosophical Transactions* for the year 1794. If twenty candles are placed in a straight line, so that the light, or fire, of each candle will pass through the light, or fire, of the other candles, yet the candles will throw the same light upon an object, equally the same as if they were placed abreast of the object. Therefore, from these experiments, it clearly appears, that one current of fire passing to and from the earth and sun will not impede another.

Very little has been known of fire, or its qualities;

ten thousand vague conjectures have been formed concerning it: in short, we knew nothing concerning it, but its effects. Light and fire many suppose different bodies; but I shall, I hope, satisfactorily prove, that they are the same body; and that, according to their impulse, or motion, they affect the retina differently.

It has been a question much agitated, upon what principle bodies are transparent? As the principles of fire and light were altogether unknown, philosophers being much in the dark concerning them, and their arguments concerning it being taken from their ideas of gross matter, they could not conceive how one body could pass through another:—but, with my principles of fire, the phænomena will have an easy solution. Gross bodies, such as sand, flint, &c. by intense heat, or fire, become fluid, and afterwards harden into a solid transparent body. By their being made fluid, their particles run into regular longitudinal crystals, leaving their interstices open and regular, so as to admit the rays of light to pass. By the operation of the fire, the sand imbibes a quantity of it, which gets consolidated with its substance, so that, when the rays of light strike upon the surface of the glass, part of them are reflected; seen distinctly by viewing windows at a distance: when the sun shines upon them, what a splendid glittering of light they shew. But the greatest part of the light, from the impulse of the rays falling upon the interstices of the glass, penetrate and pass through it, and those rays which fall upon the matter of the glass are reflected; but its matter is a small proportion to its interstices. The great object gained by dissolving the sand with the fire, is getting its fibres to run into regular interstices; and also, by the fire which the fibres of the glass imbibe and fix, uniformly and regularly

regularly repel the light, that it is not attracted by the matter of the glass out of its rectilinear course as it passes through the glass.

All the fire that comes from the sun, comes to us as the strongest and most vivid light; but, as it passes from the earth by the agency of water, it leaves the earth as fire, its impulse being greatly lessened; but when it leaves the water, being then free, the repulsion of the fire of the earth gives it more force, or motion; and, as it arrives at the sun, the great attraction of the sun's matter powerfully attracts it, and both these powers give it all that impulse, so as to form the vivid light it had when it came from the sun to our earth. The facts to prove this doctrine are very numerous. If I expose a piece of black woollen cloth to the sun, it absorbs the light, which heats the cloth, and which light, if the cloth is exposed to a colder body, will impart this light to it as fire, it losing that impulse which is necessary to its being light. But, if I take the cloth, while it retains this fire, and give it a strong attrition, the fire then will regain its impulse, and leave the cloth as light, passing from it in bright corruscations.

The tallow of a common candle contains an immense quantity of fire; but, according to the quickness of its being set loose, it will accordingly shew different degrees of light. If it is burned in an impure air, it will give a very dead yellow light; but if it is burned in a purer air, *viz.* the pure air made in the laboratory of chemists, its light will be most white, vivid, and bright. The burning of sulphur gives a dead blue light; but if burnt in this air of the chemists, it will be vivid and bright. All this difference is owing to the impulse, or degree, with which the fire is set loose; for, according to that degree, the fire will be repelled; and, as the particles

of fire repel each other, therefore, in consequence, the greater the body of fire set loose at the same time, the greater the repulsion. Every one must have remarked, that, in collecting the weeds of a field after ploughing, in order to burn them, if the fire is slowly conducted, all this fire that the dead vegetables possess will be consumed, or let loose, without shewing the least light; but, if the fire is assisted by a brisk wind, it will form a large and vivid flame. In the first case it smothers and burns, (as it is vulgarly called) without producing any light, but a great degree of heat, or fire. It is owing to this degree of impulse of the same body, that in one case iron, when ignited just below a red heat, gives out an immense degree of fire, but no light. And, in the other case, a glow worm, which gives out comparatively no heat, or fire, but a very vivid light, its organs being formed by nature to give the fire that impulse from its body of animal heat. Ten thousand other examples might be named, but these are sufficient for my purpose.

In the light passing through green glass, can it be supposed that all the other rays are reflected from the glass? If so, their reflection would give a very vivid light; but green glass does not reflect so vivid a light as crystal glass does.

That the rays of light are fire, I think there can be little doubt, when the subject is philosophically considered. In our winter, in the sun's absence, all nature is torpid, cold, and inanimate; but, in the summer, all is life, heat, and animation. The sun and its power, and also the principles of fire, have not been observed hitherto, so that their principles being not at all known, the most vague and trifling conjectures have, in consequence, been given to the world concerning them: in short, there was a great
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bar in scientific knowledge to be surmounted, before any just reasoning could be founded on these abstruse objects ; how far I have surmounted that bar, I leave to the impartial world. To give a detail of all the vague opinions, is unnecessary : they must be known to my reader ; but I will give him a very simple experiment, which clearly ascertains that light and fire are the same body. I take a large glass decanter, and fill it with water, and place in the centre of the water a body either made of earth, stone, or wood, and cover this body with either black paint, or a piece of black cloth, and then throw upon this body a quantity of the rays of the sun by the aid of a mirror, but not so strong as to ignite the body, and all this light will clearly be turned to heat, or fire ; for there will not a particle of light come from the black body, but an immense quantity of fire, proved evidently from the water being heated, and the fire escaping by evaporating the water : and by still keeping the decanter filled with water, as it is evaporated, you may go on, *ad infinitum*, with the same materials, only requiring fresh water. Here clearly nothing but fire comes from these rays of the sun, and not a particle of light, if you should go on with the process till doomsday. Now I hope that no one will dispute, that it is fire which forms water into vapour : to give any other explanation, is idle and unphilosophical. But what I must again repeat, it is not my business here to refute every vague idea that has been given to the world. I am forming a great and general system, which I hope rationally accounts for all the phenomena ; that one part of it, as it were, grows out of the other ; every link of the great chain hangs easy upon its neighbour, and is to each other the strongest evidence. This fire, or rays of light, as long as they have their impulse, or
 motion,

motion, act as fire and light; but as soon as they lose part of their impulse, they then act as fire; and, therefore, when they fall upon our earth, part of them is reflected as light: but the greatest part loses part of its influence, or impulse, and forms fire.— But even those rays which are reflected from the earth's surface are attracted by it again, and also form fire; but a great part of this fire chemically unites with the earth, and forms different bodies with it, as I have before shewn, *viz.* animals, vegetables, and minerals, also the atmosphere; and, if the fire is set loose from any of these bodies by combustion, &c. if it is done intensely, or with a great impulse, it forms light again; but if more gently, or with a less impulse, it forms fire without light: but then, when this fire returns to the sun again, it receives such an impulse as to form light.— Indeed, from our knowledge of animal vision, we must know that this fire, or ray of light, must have a certain impulse, to fly in a right line so as to penetrate to the bottom of the eye, and to fall upon the retina with such force as to give the impression to the brain, by the medium of the optic nerve.— The fire either coming from the sun to the earth, or from the earth to the sun, must be highly and vigorously impelled, from the short time which Dr. Bradley has so accurately shewn the light to pass from the sun to our earth; and, from its velocity, we must, from our principles of mechanics, ascertain its very great *impetus*. As the light is constantly in a continued stream passing, one particle impels the other, so that the fire receives a stronger *impetus* from passing from one planet to another, than we can possibly give it by the combustion of bodies. And, when we reflect upon it, it is not to be wondered at, when the fire of the whole planet gives the *impetus*,

impetus, or repulsion, to the fire that leaves the planet, and to add to that the attraction of the planet which receives it, and that planet still keeping its coldest side to the fire, or that side which has been cooled by the night.

Upon examining the appearance of the planets, we will have the greatest reason, from their appearance, to believe they are transmitting light from their surface. They are all strongly luminous, and appear to the eye as if they were bodies on fire: for, only suppose the city of London in flames, every house burning at the same time, in the highest state of combustion; and suppose an eye placed an hundred miles distance from the fire, commanding distinctly the object, and it would not have so luminous an appearance as any of the planets have. And let me ask, what a small degree of light can be supposed to come from the planet Herschel, being eighteen hundred millions of miles from the sun, if the light that it shews were only from reflection, and this light to be reflected the immense distance to our earth? Besides the stars, which Sir Isaac Newton supposes suns, do not shew to appearance more light, in comparison to their diameter and their distance, than our planets do; and yet are supposed to be suns, or globes of fire, and the latter having merely their light from the suns, and that light reflected to us near two thousand millions of miles. Besides we do observe, that all the planets appear to be equally luminous, according to their distance; while, upon the idea of their light being only reflected, the planets nearest us ought to appear a thousand times more luminous, considering that Mercury, the nearest planet, is only 37,000,000 miles distant from the sun, and Herschel near eighteen hundred millions. Jupiter is calculated by Sir Isaac Newton to receive only the twentieth part of

of the light, heat, and attraction of the sun that we do. Then what must Herschel receive? Can it be supposed to receive so much as to appear equally to the eye to possess as much light and heat as the suns or stars possess? It appears, as I observed before, equally as luminous: the reason why it does not appear so distinct, is owing to its size, and not owing to its being less luminous.

But let us consider the light that a body gives from reflection. Philosophers, I am certain, have not maturely considered it, or else they would not have supposed the planets could have appeared so luminous from merely reflecting the sun's light.—Even supposing there were no clouds to intercept the sun's rays from falling upon our earth, but it was a clear sun, still the reflection of that light we could not suppose to traverse so many millions of miles, as it must do from the planet Herschel, particularly as that planet is supposed, by the former systems of philosophers, to get so little of the sun's power. But we know that our earth is often covered with thick clouds, that not only must hinder the reflection of light, but must also greatly intercept the sun's rays from falling upon the earth. Let a man cast his eye upon the grass upon the surface of the earth, and then ask himself this question,—Can the light which comes from it traverse so many thousands, nay millions of miles, and, most wonderful! appear a thousand times more luminous when at that distance, than it did upon the grass? For look at the planets, or our moon, what a luminous and splendid appearance they have. Philosophers have not considered this. But, as the planet Mars is supposed to resemble our planet, the earth, the most, let us consider it. It is removed forty-nine thousand miles further from the sun than our earth; when we pass near it,
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and distinguish it most clearly, it has a very fiery appearance, and is often mistaken for a comet.—And therefore we have reason to suppose, according to philosophers, that our earth must have a more fiery appearance than it, as our earth is so much nearer the sun. Then, when we have our eyes *close* upon our earth, has it a fiery appearance? How then, according to them, can this green surface of the earth and its waters reflect this fiery appearance through so thick and cloudy an atmosphere as we possess, and to such an immense distance, thousands of miles. But when Mars is upon the opposite side of our orbit, it appears small, and scarcely to be distinguished from a *fixed star*,—a fixed star, which our philosophers say is a burning sun. This is still more wonderful. It now appears equally bright as a *sun*, or *star*. Can this be from reflection?—Unphilosophical!

As Mars is supposed to resemble our earth so much, the obliquity of their ecliptics is not very different. And it is flat at its poles like our earth, and these appear brighter than the other parts of its surface.—These are facts which still more astonish us. How can they be reconciled to our philosophers and their doctrines!—The poles, according to Sir Isaac's philosophy, ought not to appear the most luminous part of any; for how can it be conceived, that the poles, which receive so little light of the sun comparatively, can reflect a stronger light than the equator: besides, it is probable, that a part of one of the poles, in its winter, has no sun,—yet it appears even then so bright. Our difficulties are more and more. I think I need not enlarge any more upon them, but see if my system will explain the phænomena; and, instead of appearing difficulties to it, they will be its strongest evidence.

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As I have shewn that the fire which comes from the sun to the planets, meets with water there, and is evaporated with it into the upper regions, and, from the cold they there meet with, they separate, the water falling to the planet as rain; and the fire, from repulsion, is sent back to the sun, the source from whence it came. All this is done in the highest regions, far above its clouds; therefore its clouds do not intercept the operation, in consequence we do not observe either the face of the sun or planets in this simple and wonderful process: and, as this vapour of fire and water seems about the upper regions, the sun's rays repel it much upon the poles, and there the separation takes place. We are certain that a quantity of water falls there; but this separation takes place in all the upper parts of the higher regions of their atmosphere, and probably beyond them. Thus this great and wonderful agent of the Deity, *viz.* fire, its being repelled from the sun and planets, gives them, when viewed with a telescope, that amazing, vivid, bright, undulating, luminous appearance, such an immense number of miles above their surface, particularly the sun; as it is it that repels the fire to the planets and the planets to it, so that they all enjoy the identical same fire, or light, or heat; the same temperature, and, I make no doubt, the same men, animals, vegetables, and minerals; the same atmosphere and water; in short, every thing the same.—What a vast idea! Reflect upon it *little man*, and humble thyself!*

Philoso-

* It is a well-ascertained fact, that bodies at the equator are specifically lighter than at the poles; which fact is, I think, a strong evidence in favour of my general system of repulsion: for, as the earth at the equator possesses the greatest proportion of fire, therefore, from that cause, its repulsion must be the strongest, and
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Philosophers supposed that the moon had no atmosphere, as they could distinguish no clouds.—Certainly not, as the light is separated from it above the clouds. The reason why we see its surface more distinctly at one time than another, is, I suppose, owing to its atmosphere being less clouded at one time than another. The *faculae*, or bright places in the sun, I suppose is owing to a greater quantity of fire and water separating at that time; as under our tropics the periodical rains; and the sun's black spots, may be owing to a very little separation; for they are too large to suppose mountains, excavations, &c. Our *aëranauts*, in their balloon excursions, when they got to a considerable height in the atmosphere, saw the face of the earth became more indistinct, putting on a bright luminous appearance, and the higher they went the change became more conspicuous, I readily believe; and I have no doubt, could they have ascended higher, this luminous or planetary appearance would have been far more striking.

We observe one thing, which indeed we have a right to suppose *a priori*, that the quickness of the planets' motion round the sun is directly according to their distance from the sun, the nearer the quicker; which clearly points out to us the cause of this motion, *viz.* the repulsion and gravitation of the sun upon the planets: in consequence, the nearer the stronger their operation.

Sir Isaac's doctrine of colour I must also question. He supposed, that the different colours were owing to the different refrangibility of the rays, some being more refrangible than others. As I have shewn that

in consequence bodies will weigh lighter. The immense quantity of fire at the equator will, from its repulsive quality, counteract the gravitating quality of inert matter.

the fire, or rays of light, have a strong impulse when they fall upon the earth from the sun, therefore these rays falling upon the retina will give the sensation of light. As we also find, that those rays falling upon the different bodies of our earth are reflected from those bodies, and make us see those bodies; so, if we enquire upon what principle those rays are reflected, we shall find it is from that great principle, repulsion. These bodies containing a quantity of fire, in consequence repel, or reflect, the rays of light, or fire, which fall upon it. Thus the body which reflects the rays of light the strongest, that we are acquainted with, is the diamond; and chemists inform us, that the diamond possesses the greatest quantity of fire, being so highly phlogistic and combustible. But bodies differ very much in their power of repelling light: white bodies do it the strongest, and black the least; also red the next in strength, and the violet the least. So there are regular gradations. As all our sensations by vision are from the stimulus given to the optic nerve; therefore, according to the degree of that stimulus, will the different sense of colour be received: when the light is strongly reflected, it will give the sensation of white and red; and, when weakly reflected, violet, &c. &c.

It is just the same when fire issues from bodies burning. If it issues with a strong impulse, the fire will be a white flame; but, if not so briskly, red; and, if with still less impulse, yellowish. Now, as I have all along shewn in my general doctrine, that the motion of light, or fire, is from its particles repelling each other; therefore, when the fire is brisk, and a great quantity of those particles being set loose at the same moment, in consequence the repulsion being greater, the fire will have such an impulse as
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each particle will give the sensation of light; but, if not set loose quite so briskly, they will give only the sensation of red; and, if still set loose more slowly, the sensation of yellow,—which colour is often seen in the night, when a fire has not been stirred with the poker. Or, if you look at a red fire through green glass, or any other body which deadens the rays, it will appear yellowish: or, looking at the great luminary of light through a very thick atmosphere, or through blackened glass, or through a feather, his rays will appear of a fiery red.* Now, with this review of the case, can it be seriously argued, that those bodies at the time are giving out only one kind of their rays, and retaining the others? To shew this most strikingly, if a common culinary fire, made of coal, consumes itself by giving out nothing but a white flame; another fire, made of the same coal from the same pit, consumes itself by giving out nothing but a red colour, must we not immediately say, that its fire, in the first instance, is set loose as light, and the other as heat? Also, from this, let a quantity of coal be put upon a smith's fire, and by keeping blowing, all the coal will be consumed with a brisk flame; but, by not blowing the fire, the coal will be consumed with a red heat. Then, according to the doctrine of some, we must say, that this coal consists of light; and, when it burns slowly, it consists of heat, or fire: they making these different bodies: Unphilosophical!—Or, still more striking, if all the combustible matter is extracted out of this coal as inflammable air, and in that state burned, it will explode, giving out the most strong and vivid

* The feather acts in this case by attracting out of their rectilinear course those rays which pass through it; and, in consequence, from that attraction, their force is weakened, and so only give the impulse, or impression, to the optic nerve of the red rays.

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light.—Or must we say with Sir Isaac, that, in the latter process, the fire gives out only its red rays, retaining all the others?—Equally unphilosophical.

But, to prove my doctrine still more forcibly, take a piece of pasteboard, and make a very small hole in its centre, so that the rays of light may pass through it, falling into a dark room upon a sheet of white paper, and in the centre of the hole place any body, a hair for instance, and it is well known, that the light will shew upon the paper the different colours of the rainbow, and that the shadow of the hair will be greater than it ought to be from the bulk of the hair. The phænomena are to be thus explained; those rays which fall immediately upon the hair are reflected back, and in consequence do not penetrate through the hole; and those rays which do not fall upon the hair, but pass by its sides, being out of the hair's power to repel them back, it will nevertheless act upon them upon the same principle, *viz.* repulsion, and repel them so, or break their rectilinear course, as to form a considerable angle, falling a great distance from the shadow, and in consequence it will make the shadow greater. The next rays that enter this hole, still further from the hair, will also be repelled out of their course; but, being further from the hair, will in consequence be repelled less, and fall nearer the shadow, and so regularly on, till those rays which pass by the hair at that distance, so as not to be acted upon by the hair, and in consequence will not be forced out of their rectilinear course, and will fall upon the paper without forming any colour. Then the regular gradation will be, those rays that pass nearest the hair, and in consequence most repelled, will form the violet colour; and those which are the least repelled will form the red colour; so also the intermediate colours will be formed. Now, as
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we know that the colours are formed in the mind from the impulse of the rays of light upon the retina, it is certainly rational to suppose, that rays forming different impulses will give different colours, just as the air, when struck with different vibrations, gives different sounds. And it is worthy of remark, that there is such analogy between the colours and the notes of music; the mind in both cases being equally impressed with similar sensations; in one case similar colours, and in the other similar sounds; and both equally delight the mind. I think no one can dispute this common principle in mechanics, that, if a body is impelled with a certain impulse, and the direction of the body is changed, it will in consequence weaken the force, or *impetus*, of the body.—Therefore, when the rays of light are moved out of their rectilinear course, their impulse must accordingly be impaired according to the degree they are moved out of that course, and in consequence effect the retina accordingly. And, as the violet colour gives to the nerve the least impulse, it is formed of those rays which are the most repelled out of their rectilinear course, and in consequence their force is most impaired, being formed of those rays which pass nearest to the hair.

It is also to be remarked, that, as the red colour appears to be next to white in impulse, so fire is formed principally of those two colours. Also, that the blood is of this colour, and which colour is owing to its receiving fire from the atmosphere. So also chemists inform us, that the nitrous acid assumes this colour either from free fire or fixed fire, which they used to call *phlogiston*.

I am sorry that my philosophy should have led me so often to refute the opinions of that first of men, Sir ISAAC NEWTON; but truth must be investigated—

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no authority can be a bar against it; and, if that great man were now living, his soul would have been pleased with his philosophy being fairly and candidly investigated: he was too great for the little, low, illiberal prejudices of envy: his exalted mind could only be open to the investigation of truth; and, whether it came from himself or others, it would be generously received, he being above the low incitements which little minds feel,—and which too often prevail with men of science.

I have been hitherto speaking only of elementary fire; but there is also a very singular fire, called *electric fire*, which has much engaged the attention of philosophers for the last half century; and, though electricians have made a number of experiments upon it, yet they are still in the dark respecting the real nature and principles of this fire; but I hope my system will throw great light upon it, and the elucidation of it will also confirm my general principles of fire.—This electric fire is universally distributed through all the earth, all bodies being saturated with it; but, like all other bodies in nature, it has the property of sometimes being thrown into masses more concentrated, or, as the electricians say, charged positively; and, in consequence, other bodies being charged negatively, or having a less concentration of it: nature's apparatus seems to be principally in the clouds, where these positive and negative charges greatly prevail, and which principally take place from the evaporation of water. One of the most striking phænomena that we observe, is the evaporation and falling of water, (and is one great cause of vegetable life, as I shall shew when I come to speak of vegetation) and, as we know that fire is the
great

great cause that produces that circulation; so we shall find that electric fire also performs a part of this circulation, though a very small part to what elementary fire does: but this electric fire does not leave our earth as elementary fire does, it being fixed to it. As water in the clouds collects into masses of different saturations; so also does electric fire.— And when two clouds differently electrified come within the attraction of one another, they will unite their fire, producing lightning and thunder. So also if a highly electrified cloud, possessing either positive or negative electricity, comes within the influence of the earth, the same phænomena will take place: there will be a discharge, and an equilibrium will be established. By art we can produce the same phænomena: charge bodies positively and negatively, and in forming the equilibrium there will be the same phænomena. But our apparatus is trifling to Nature's.

My general principles are these, that the electric fire is the common elementary fire united to the mineral acids. That it possesses fire, I need not enlarge upon; and that it also possesses an acid, I think appears obvious from its acid taste when it is applied to the tongue; and that it has a strong sulphureous smell; also that acids and fire have the strongest attraction for each other of any bodies in nature; and, according to its being formed of fire and acids, we shall find that its qualities perfectly agree with the qualities of these two bodies. As fire is then united to one of the strongest and heaviest bodies on our earth, it will be stationary to our earth, the attraction and gravity of the acid will keep it attracted to the earth, and, from the repulsive power of fire, it will be universally distributed through all parts of the earth.

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suppose is in the bowels of the earth, where the mineral acids so much abound. We must be certain that the bowels of the earth possess a quantity of fire and acids; which, as I observed before, we are sensible of by digging into the earth.—The very same phænomenon takes place with water. Water is evaporated pure; but, when it falls upon the earth again, a part of it gets a slight impregnation with acids, *viz.* fixed air and mineral acids. Therefore, from the same cause, a part of the elementary fire gets a slight impregnation with the acids, forming the electric fire. This electric fire then will have the qualities both of fire and gravitating earth.

But let us attend to the different phænomena which electricians have given us, and see whether they will accord with my system. They divide bodies into electrics and non-electrics, the latter being pervious to this fire, and the former not. Just the same as bodies which are transparent, or admitting the rays of light to pass through them, and others that are opaque;—and, I shall shew, upon the same principle, bodies which admit of the light passing are saturated with a great quantity of fire; so are non-electric bodies, metals, charcoal, water, &c.—The calx of metals is a non-conductor; so is baked wood; but when, having a quantity of fire, so as to form charcoal and metals, they will admit of a free passage of the electric fluid. By possessing a quantity of fire, either fixed or free fire, the bodies will repel the electric fire, so as to hinder its being attracted, or stopped in the body, and in consequence will pass through it, the body having got its full saturation of fire, therefore cannot attract the electric fire; but the bodies which have not got their full saturation of fire, will in consequence attract upon their surface this electric fire; for it cannot penetrate the surface
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from its being attracted to it, that is, by the matter of the body upon the surface. Just so in bodies being transparent or opaque. Flint is opaque; and, when the rays of the sun fall upon it, they are hindered from passing through it, in consequence stopped, and the body is heated. But if this flint is exposed to a strong heat in a furnace, it will imbibe a great quantity of fire; and from its getting its saturation of fire, and from its particles being formed into regular crystallizations, it will admit the rays of light to pass through it; therefore transparent bodies admit of a free passage to the rays of light, and in consequence are not heated by them. Fire seems necessary both to bodies emitting light and the electric fire through them. Paper, which is opaque, by oiling of it, it becomes transparent, or admits light to pass through it. So the calx of iron, by heating it with oil, becomes a metal, and admits of the electric matter to pass through it; also admits of the magnetic electric fire to pass through it. Fire acts a wonderful part in the creation, from its repulsive quality, for it is from this quality that it is the author of combustion; for, when bodies burn, it is from the immense heat or fire set loose, and the continuation of that combustion is from the fire's repulsion and breaking its chemical union in the combustible body. —The fire may also be set free by attrition: the mechanical force exerted will also break the chemical union, and set it free. Thus in violent motions bodies take fire. It appears singular, that glass, which is so pervious to light, is not so to the electric fire; which is owing to this cause, that the electric fire consists of an acid as well as fire; therefore it has a great attraction, far more than elementary fire has for inert matter; seen distinctly in its giving phlogiston to the calx of metals, and reviving of

them: and also, if it is passed through acids, it will unite to them, forming with them different airs, as that great experimenter, Dr. Priestley, has shewn. Besides many other examples which I might produce, shewing the great attraction it has for matter, it being so much more susceptible of being fixed or chemically united to bodies as fixed fire, than elementary fire is.

Water also we know possesses a quantity of fire; but, if that is taken from it, as in ice, it partly loses its quality of a conductor. And in glass, if it is made hot, it will become a non-electric, or conductor.

As glass is a non-conductor of electrical fire, it will, from the matter which it contains, attract the electric fire upon its surface; from two causes,—First, All bodies, or inert matter, have an attraction for fire; and, secondly, all inert matter has an attraction, or gravitation, to each other: therefore, as this electric fire possesses inert matter, or an acid,* the matter of the glass will attract it. Then, in consequence, in an electrical apparatus, by the attrition produced, the fire which is upon the surface of the cushion will be mechanically rubbed off, and it will attach itself to the glass; so the cushion being in consequence negatively electrified, it will also in consequence receive more fire from the earth, and the heat upon the apparatus being produced by the friction, will aid the electric fire in forming itself into a concentrated mass, upon this simple principle, fire repels fire; therefore the elementary fire will repel the electric fire, so *vice versa*. This is clearly shewn in

* I have all along called the gross matter of this earth inert; but it is not physically so, as the particles of this matter have a gravitation, or attraction, for each other: but the reason I call it inert is, in opposition to fire, which receives such an amazing activity of motion from repulsion.

the Tourmalin stone; by being heated, one part of it becomes electrified negatively, and the other part positively. The glass globe of the apparatus being electrified positively, will transmit its superabundant electric fire to other bodies, and which is done by a metal conductor insulated, and is received into a Leyden phial lined with tin foil, which phial is in consequence highly charged: the tin foil and the air of the phial attracting the electric fire. But, as I have all along shewn, and by which nature conducts all her operations, fire has this amazing repulsive quality, that the highly concentrated electric *cloud* (if I may be allowed the simile) in the phial repels the electric fire which the outside of the phial was saturated with, being that saturation which all bodies possess. In consequence the phial will receive as much electric fire from the conductor, or glass globe, as would saturate both the inside and outside of the phial.

The apparatus seeming to have this effect upon the electric fire, that it alters its universal distribution, collecting a greater saturation, or concentration, upon one part of the apparatus than the other; in consequence, whenever that is the case, either by nature or art, this higher saturation will, from the repulsion of fire, produce within its action, or power, a negative electricity. In its equilibrium state, there is an equal repulsion, one part repelling equally the neighbouring part: but, if by nature or art that equilibrium is destroyed, a greater power of repulsion is consequently induced, and all the electrical fire in the neighbourhood of that concentration must in consequence be repelled, and induce a negative state. —The equilibrium is first destroyed between the cushion and the globe, and afterwards between the inside and outside of the Leyden phial; therefore, whenever a conductor communicates between the
positive

positive and negative states, or between the cushion or the globe, or the inside or outside of the phial, from the great repulsion of fire, the equilibrium will be restored, and that with great force. Fire in itself has no great mechanical force; but it is owing to its being joined with inert matter; as when it evaporates water, (seen in the fire-engine, or in the explosion of gun-powder) the fire unites to the acid; and, when so combined, it is powerful indeed. But I suppose that the electric fire is like the common or elementary fire in this particular, that it is impossible to make a perfect negative, or totally to deprive a body of it; therefore its positive and negative states are only comparative. If the Leyden phial is insulated, it is impossible to charge it, the repelled fire having no passage for itself, and therefore the outside of the phial, from containing its natural saturation, will repel the fire of the inside so, as that the phial cannot receive a charge. As all bodies possess an equal quantity of this electric matter in their neighbourhood, when undisturbed, just the same as all bodies possess an equal quantity of fire in their neighbourhood when undisturbed.—By being undisturbed, I mean being not affected artificially either by an electrical apparatus or common combustion, &c. both the electric and elementary fire having that great principle of equally distributing themselves, from their repulsion. This great repulsive power of the electric fire that we can produce upon the electric apparatus, has its limits; for we cannot electrify a phial whose sides are half an inch thick, from this reason,—the electric fire cannot act upon, or repel, the electric fire on the outside, through so thick a glass. And it is amazing what a strong mechanical power this electric fire possesses; for, when a phial is highly charged, the fire will sometimes

times penetrate through the glass, bursting it, in order to restore the equilibrium between the outside and inside of the phial.

Fire has a strong attraction for inert matter, as I have all along shewn in this treatise; but when fire is united to inert matter, as in the electrical fire, it will in consequence have a stronger attraction for inert matter. Thus if light bodies are placed near a highly electrified body, the electric fire and the body will greatly attract each other; and, as the light body is the easiest moved, it will be attracted by the electric fire; but as soon as it gets saturated with the electric fire, the two fires, *viz.* that of the conductor and that of the light body, will repel each other; but, if the light body meets with another body, it will give to that body its superabundant electric fire, and in consequence having lost part of its fire, it will be attracted again by the electrified body: or if two pith-balls be electrified, they will repel each other; or if one is electrified positively, and the other negatively, they will attract each other, which phænomena are from the repulsion of fire, and its attraction for inert matter. If two pith-balls are both electrified negatively, they will even repel each other, which is from the repulsion of fire; for this negative state is far from a total deprivation of the electric fire.

As all bodies possess a quantity of this electric fire, owing to its general distribution; and, when a body is burning, or having its fixed fire set loose or free, in consequence its fire will repel the electric fire the body naturally possess, from the general distribution; and the electric fire will be concentrated, or repelled, into an electric atmosphere about the burning flame, (if I may be allowed the expression) and, if a conductor is applied to the flame, it will receive the electrical fire from the burning body; but, when the
flame

flame is extinguished, in consequence the body becomes cool, it then having lost its electrical fire, it will become negatively electrified. Thus sulphur, if it is melted, the heat, or fire, required for its melting will repel its electric fire; and, if it is melted in a glass vessel, being an electric, it will receive the sulphur's natural saturation of the electric fire, and become electrified; and, if the glass vessel is placed upon electric bodies, as the escape of the electric fire will in consequence be more impeded, the glass will be more highly electrified; for the glass being also highly heated, is also, from that cause, rather disposed to repel part of the electric fire; but, when it is placed upon other electric bodies, that escape is, as I observed, more impeded; and, if the glass is coated with metal, it will aid it in retaining the fire, and in consequence, as in the Leyden phial or jar, its electricity will be stronger. In these cases, the glass is always positive and the sulphur negative.

But, if the sulphur is melted in an earthen vessel, and placed to cool upon uninsulated conductors, it is strongly electric when taken out; but, as I have just shewn, it is not so when it has stood to cool upon electric substances, for the electric substance, the glass for instance, has an attraction for the electric fire; and this fact will elucidate, why the glass or electrics in the electric apparatus receive the fire from the cushion. These explanations and history of electricity will, I think, account for all the phænomena.

I have not noticed the theory which supposes two different fluids, the one vitreous, and the other resinous; and from those fluids having a strong attraction for each other, being the cause of the different electrical phænomena,—it being so directly opposite to all our known laws of fire, that two *igneous* fluids should attract each other; for this law in nature, that fire
repels

repels fire, is as certain as the law of gravitation; and any hypothesis that goes so far to contradict it, as even to suppose two *igneous* fluids can attract each other, does not, I think, deserve a serious refutation.

That all fires repel each other and themselves, both elementary and electric, we see distinctly from all the phænomena. If a cork ball be suspended by a silk thread, and is held to the charged conductor of the electrified apparatus, positively electrified, the side next to the conductor will be electrified negatively, and the opposite side positively; from the fire of the conductor repelling the electrical fire of the cork ball to the side the furthest removed from its influence. It is just the same in the Tourmalin stone when heated; the elementary fire will likewise repel the electric fire, so that it will also have a negative and positive side of electricity. I could bring many other examples, but they are unnecessary.

The greatest beauties of my system are, I think, its simplicity and its embracing so many phænomena, that one part, instead of contradicting another, seems to be its strongest support and evidence.—I shall now consider *magnetism*; and, I flatter myself, I shall be able to account for its phænomena; and the causes I shall assign for it will also strengthen my general system.

I suppose there is a fluid which is constantly emitted from the south pole of the earth, and is as constantly imbibed, or attracted, by the north pole; and that this fluid is the electrical fluid. We know that the electrical fluid is universally distributed through the earth; that all bodies are saturated with it; and, from the repulsion of fire, it must be distributed every way. Then the great internal body of the earth must be saturated with it, and must in consequence be susceptible of all the laws of electricity.

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Now let us consider those laws. As the earth must possess such a quantity of this electrical fire, and by its surface being covered with water, and which is so great a conductor of electricity; this water will constantly be operating upon it, so as to produce a circulation of the fluid; and, as in all bodies upon this earth, and particularly upon all fluids, they have a constant circulation, in order to keep them pure and unchanged. Thus the waters of the ocean by the tides, and the atmosphere by the winds; therefore nature, we will suppose, has induced a similar circulation in the electric fluid;—and, I hope I shall satisfactorily shew, this is done by that great conductor, water. But, as fire repels fire, so the elementary fire, which the seas of the earth are saturated with, will repel the electric fire; therefore those seas which have the highest saturation of elementary fire, will imbibe, or attract, the least of the electrical; and those seas which have the least of the elementary, will attract the most of the electrical fire; in consequence the water at the poles will operate the strongest; and, as the south pole has the most water, therefore it will operate the strongest upon this fire: first, from its being water, and, secondly, from its being saturated with so little of elementary fire, it being the coldest part of the globe. Therefore, from all these considerations, it will constantly be receiving and conducting this electrical fire from the earth; and this electrical fire will, from its repulsive quality, be as constantly diffusing itself, and in consequence it will be attracted by that part of the globe which has so little fire, either elementary or electric, and which is the north pole: so as the south pole emits it, the north pole imbibes it. That elementary fire repels the electric fire, I have before fully shewn in the glass globe of the electrical apparatus,

ratus, in the Tourmalin stone, in dissolving sulphur by fire, and in the combustion of all bodies. This emission and imbibing of this fluid then will produce a constant circulation of it, and by that means keep it entire or pure. That it has a great tendency, or circulation, to the north pole, is seen clearly in the *Aurora Borealis*, which hovers over it to receive admission. Then the earth is a great magnet circulating this electrical fire.

Iron, of all the metals, has the strongest attraction for this electrical fire; and its ore, which lies in the direction of the circulation of this fluid, will, from having it regularly circulating through it, become a magnet. But, as the great stream of this electrical fire is from the south to the north pole, and in the internal bowels of the earth from the north to the south pole, yet different parts of the earth receive a small part of the circulation. Thus that part of the earth which we inhabit in this island. And therefore all iron bodies which stand perpendicularly, as the iron bars of windows, the family utensils, such as the poker and tongs, which are kept in a perpendicular position, will attract this electrical fire, and so conduct it into the earth; in consequence they will become magnetic, that is, their high end receives it, and the low end, which rests upon the ground, emits it. So also iron that has been constantly kept in an horizontal position, with one end regularly pointed to the south, and the other to the north, receives this polarity, its south end becoming the receiving end, and the north the emitting end.—And iron, by art, may, in a very short time indeed, become magnetical. Thus the great means to do that to the highest perfection, is by giving the iron as much phlogiston, or fixed fire, as it can be saturated with.—Dr. Knight's process was by kneading
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the iron filings with oil.—Mr. Canton's was by heating iron with leather, &c. These phlogistic bars of iron then, by being rubbed with a magnet, or even without a magnet, by being placed to the end of a poker for a short time, and then rubbed with other pieces of iron which had got polarity, in the direction of the earth's poles, that being the current of this fire, become magnetic. But, for the process by which this wonderful operation is conducted, I must refer my reader to the authors who have written on the subject: my object is only to assign the cause.

Iron has the strongest attraction for this fire; indeed it is a body which has the greatest attraction for fire, for it is capable of being supersaturated with fixed fire, and which is the case with no other metal. Thus iron may receive a supersaturation of fire, so as to become steel. Then iron has the strongest attraction for this electrical fire. But in the common state of iron, without it has undergone the process I have just named, it will not circulate this electrical fire. That it will circulate the electrical fire, we know by art from an electrical machine; but this fire so produced and circulated has a strong impulse, so as even to kill animals, from its being highly concentrated. But the gentle impulse by which it travels from pole to pole, is not sufficient to conduct it through iron in that *rapid stream* which is necessary to its becoming a magnet; but this is very easily accomplished, by passing an electrical spark through iron; or by keeping it in that position for a long time by which nature may do it herself; or by rubbing a magnet along it. All of which processes seem to produce their effect, by sending a stream of fire through the iron's pores, so as to clear its channel, as it were, removing all obstructions to its circulation, and this once obtained, it becomes a magnet. Rubbing the iron with a magnet seems to operate by
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giving it a quantity of this electric fire, and this additional fire will repel the electric fire it already possesses, and, aided by the mechanical force, breaks open the obstructions, so as to free the channel for the fluid to flow; and, by art, placing the magnetical bars of iron in a position that this fluid may circulate freely through their north poles to the south poles, and also their south poles to their north; so that, by the current constantly flowing through, the passages will in consequence be more cleared. The great art is, first to open the passage, and then to keep the current as strong and rapid as possible passing through them.†

It is singular, why glass should admit of light passing through it; why metals, water, and charcoal should be the conductors of electricity; and why iron should be the only conductor of this mild and gentle stream of it producing magnetism; but so it is,—and I hope I have given a satisfactory explanation of each.

The next phenomenon to be considered is, how comes the magnet to attract iron so strongly. That this electric fire has a strong attraction for matter, I have shewn before,* from the phenomena of the electrical apparatus. If light bodies be held within the attraction of an electrified body, or the electrified globe of the apparatus, they will immediately fly to it. The cause I assigned for this was, that this electric matter consisted of fire and an acid, both of which bodies have a strong attraction for matter, or other bodies, and particularly for iron, as it is capable

† It may also operate in this way: by passing a constant stream of this electric fire through its pores, this fire will give these pores a full saturation of fire; so that, having got their full saturation, they will no longer attract and resist the passage of this fluid.

* This fire will not circulate in *vacuo*.

of receiving a proportion of fire beyond its metallic state, as in steel; and also that acids, chemists inform us, have the strongest attraction for iron; therefore a magnet which has such an over proportion of this electric fire passing through it, will in consequence, from being constantly filled with this fluid, have a great attraction for iron; and that this fluid has not only this attraction, but it has also its repulsion — And this is clearly shewn by applying the two emitting ends of magnets together, for they will repel each other, and which repulsion directly proves these fluids to be *igneous*, and also that they *are fluids*.

One very striking phænomenon in electricity is, that bodies electrified positively will impart their fire to bodies in a stream of light similar to the shape of a diverging cone; and that bodies electrified negatively will receive the electric fire from other bodies in the shape of a small globe or point of light. So in the south pole, which, I suppose, emits this fire, it is observed by mariners, that the needle is affected many degrees round the pole, it emitting its fire similar to all electric bodies; and that the north pole has the needle more centered in its attraction of it to a point, similar to the negative bodies receiving electricity; and the variation of the needle, which has been tending westward for some years, may be accounted for from the axis of the poles of the earth varying their position to the ecliptic—But I shall treat more particularly of this hereafter.

Many philosophers have supposed this magnetic fluid travels from the north to the south pole,—and not as I think, from the south to the north pole. Indeed it is not very clear which way it flows; but certainly the fluid passes from one to the other. And, when we consider the great quantity of this electric fire which goes to the evaporation of water into the atmosphere,

atmosphere, and also circulates through vegetables into the atmosphere, nature must have some great process to carry it back again to the earth; and this is done, I suppose, from one pole constantly imbibing it, and the other as constantly emitting it; at least, all that part which had not been emitted by the evaporation of water and the circulation of vegetables. The great leading principles of magnetism are, I suppose, that, between the water and earth of the globe, there is a constant circulation of this fluid; that one is emitting it, and the other constantly receiving it; that the coldest parts of the globe do circulate it the most freely, elementary fire repelling it, which is plainly seen by the needle's altering its direction as the sun advances westward, the needle driving to the westward till three o'clock, P. M. Therefore the principal circulation will be between the south and north poles, and the greatest current of this circulation we shall find from the water to the land of the globe.—That, in attending to the needle, we shall see how this magnetical fluid flows; and I think the observations will strengthen my hypothesis, that the water is emitting it, and the land imbibing it; with this great restriction, that it is only in the cold parts of the globe where the great emission and imbibing of this fluid principally take place. Then, in the south parts of the globe, this fluid will flow from the waters of the south pole upon the land of the southern hemisphere. Thus, in New Holland, that great body of land the nearest the pole, upon its westerly side the needle will point due north, balanced by the great body of land of Africa and New Holland; but, as you steer either east or west from thence, either land will predominate; steering westward, Africa predominates, the needle pointing westward; but, at St. Helena, between the two great continents

continents of Africa and America, the needle points north, the current flowing upon the great projecting African coast. As you still sail south-west, the great body of land of Africa, Asia, and Europe will have this current flowing upon it, from the west side of the American southern pole, till you get about twenty degrees west of the Straights of Magellan, and then the needle points north, the current flowing upon the great body of land of North America. Still steering westward, as you advance midway between Chili and New Zealand, the variation will become a little westerly, being attracted by the east parts of New Holland, Asia, and Europe.

This direction of the needle at the south pole, I suppose is principally operated upon by the fluid at its emission; but, when you arrive at the equator, it is there equally balanced by the emitting and receiving bodies; and at the north pole principally by the admitting or receiving body; so its direction may be equally traced upon the north pole according to the situation of the receiving body, which is the land. But that this current varies considerably, according to the part of the globe the needle is in, and which must be acted upon according to the respective situations of the land and water in that particular part, every different part of the globe altering that respective situation, the earth and water being so irregularly placed upon the globe; therefore we can have no regularity. But that the needle is always affected when it approaches great continents, or bodies of land, is thoroughly ascertained.—The greatest variation of the needle is in Hudson's Straights, and the mouth of the river of Rio Plata, though nearly under the same meridian: at one place the needle varies $29\frac{1}{2}^{\circ}$ west, and the other $20\frac{1}{2}^{\circ}$ east, and which must be owing to the needle at the river

river Rio Plata being under the influence of the magnetic current of the south pole; and, when at Hudson's Straights, to the current of the north pole.

I hope I have now given a satisfactory detail of these extraordinary phænomena of electricity and magnetism; but I have not enumerated every fact, and accounted for each in particular, as I thought that unnecessary, as I have for all the leading ones that were necessary to the elucidation of this intricate subject; and, from the general principles given, I think my reader can find no difficulty in making the proper explanation of all the rest; for, I flatter myself, my system fully elucidates and embraces all the phænomena relating to both magnetism and electricity.

This electric matter is of the utmost importance to our planet, the fire being stationary and fixed to it, and from its greater attraction for inert matter, or bodies upon our earth. It is therefore, I suppose, a great and powerful agent to animal, vegetable, and mineral life. As fire is so necessary a body to life, and this electric fire is more susceptible of being fixed, it therefore will be constantly uniting to matter, and aiding in forming bodies, particularly vegetables,—which I will shew hereafter; and in the bowels of the earth, where acids and fire abound, it will get itself renewed again. And also in the destruction of these bodies, animal, vegetable, and mineral, the electric fire will be decomposed, and set loose as separate bodies, *viz.* fire and an acid, it undergoing the same change and dissolution as all bodies upon the earth. And it will also assist in planetary repulsion, as it is constant and stationary to the earth.

I think volcanoes, those great combustions of nature, must have a powerful effect in setting ele-

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mentary fire free, when the earth is overcharged with it, so that it may do its office again in travelling from planet to planet.

But, before I conclude, let me pay a proper tribute to Sir Isaac Newton, that first of men, whose great and extensive mind hath so fully elucidated nature in various great and essential points, particularly in her great law of gravitation, tracing the finger of God, and struck with his power in the natural world, so that Sir Isaac's mind was full of veneration for his power. But that his system of gravitation alone is not adequate to account for the phænomena, I have, I hope, fully shewn. For, suppose that it were equal to the planetary phænomena, one sun and its planets balancing the next sun and its planets by gravitation, yet all these suns and planets must have a boundary; therefore, if we suppose it is by being balanced in being attracted different ways by different stars, we must expect that the stars on the outside, if there are any bounds to the creation,—to the works of an infinite Being, will rush inwards, till all be involved in one mass or heap. Therefore, in whatever point of view we see Sir Isaac's system of gravitation, it is involved in insurmountable difficulties, irreconcilable to any law.

But the same great mind that unlocked nature's secrets, saw with the same perspicuity the well-founded doctrines of the Christian religion, though it is said of him, that, in his early years, (according to Dr. Johnson) he was a clamorous infidel; yet, when his judgment was mature, and his knowledge most extensive, he clearly perceived that there must be a great Being that formed, directed, and gave life to the works of the creation, and that great Being was fully discovered in the Christian religion. It is said that philosophers are often infidels, which I believe
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may be true of superficial researchers; for, always looking to some cause for the phænomena in nature, they therefore are apt to refer every every thing to natural causes, and rest satisfied with that opinion;—but a mind such as Sir Isaac's was, sees clearly that there is a cause above them,—the first mover, who ordained, directed, and put in motion all these causes and effects, *and which is God.*

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